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WHY CHIMKENT CHEMICAL INDUSTRY WORKERS ARE BEHIND SCHEDULE

Alma Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 9, 1979, signed to press 3 Sep 79, pp 20-27

/Article by A. Petel', Special Correspondent, Alma-Ata-Chimkent-Dzhambul-Karatau/

/Text/ The phosphorus industry is far from the least important industry in the industrial development of the country. High-capacity phosphorus producing plants were erected within a comparatively short time in southern Kazakhstan. However, they all are very far behind schedule in fulfilling their plan tasks and the rate of increase of production of the basic product (yellow phosphorus) is very, very low.

The unsatisfactory operation of the Chimkent production association "Fostor" causes special concern. As you may know, this enterprise, quite recently, was highly progressive and was awarded the challenge Red Banner of the CPSU Central Committee, the USSR Council of Ministers, the VTsSPS /All-Union Central Trade Union Council/ and Central Committee of the VLKSM /All-Union Lenin Young Communist League/ for the results of the All-Union Socialist Competition for 1976.

What is the cause of disruption of the production rhythm of the Chimkent chemical industry workers? In our opinion, the answer to this question presented in this article will partially explain the problem and suggest reserves for growth not only for this association but for the subsector as a whole.

The Very Beginning

Managers of the "Fosfor" association explain the failure to fulfill the plan tasks and to perform the socialist obligations, first, by the low quality of the phosphate material obtained from the "Karatau" industrial union.

They declared that the high content of different admixtures in the ore, impairs the technological process for yellow phosphorus production.

These arguments are confirmed by examples.

Since April of this year, the first production of yellow phosphorus, where the RKZ-48f /Charging Control Relay/ furnace was installed, began to process Dzhanatas phosphorites instead of the Aksayskiy ores used previously. Examination of the "behavior" of the new raw material in ore heat treatment furnaces (the study lasted for 1 month and was performed by associates of the central laboratory of the association and KazNIIGiprofostor /Kazakh Scientific Research Institute of the State Planning Institute of Phosphorus Production/) produced unfavorable results. Thus, an insignificant increase of the coefficient of operating time of the ovens was accompanied by a reduction of their average hourly productivity in comparison with the production from Aksayskiy phosphorites by approximately 17 percent. The amount of slag produced also increased noticeably.

Science explains this by the high level of harmful lithological varieties in the Dzhanatas raw material. How did the Chimkent chemical industry workers approach the solution of this problem?

A.S. Atlyatunov, head of the phosphorus production sector of the central laboratory of the association says:

"Today there are practically no scientifically substantiated requirements for phosphorites to be used in electrothermic processing. All existing standardization documents, which determine the quality of phosphate raw material, consider only the stability of chemical composition, that is, the level of phosphorus anhydride and the insoluble residue and also the granulometric composition -- with the exception of the fines level (class -- 10 mm)."

"We think it is necessary," continues Aleksandr Saitgaliyevich, "to introduce into the technological requirements for raw material an entire series of new parameters which consider both the mineralogical composition and the technological properties of the ore. Experience accumulated justifies the following requirements for phosphorites: the content of phosphate varieties should be at least 90-92 percent and all forms of shales should not exceed 4 percent and the level of other varieties should not exceed 4 percent. With all of this, the concentration of phosphorus anhydride should constitute at least 23.5 percent and the level of insoluble residue should not exceed 20 percent."

A.S. Aflyatunov presents an example in support of his opinions. From November 1978 to February 1979, Chimkent workers received ore, for second production, of precisely such a composition. In this period, the highest productivity was obtained from the RKZ-72t furnaces.

At first glance all of this sounds quite convincing: formulate the appropriate scientifically substantiated requirements for raw material quality, give us good ore and the matter of fulfilling the plan tasks will be settled.

In other words, the Chimkent chemical industry workers propose the adaptation of the phosphate raw material to the processing technology and not the reverse, that is, the adaptation of the technology to the raw material. It does not matter greatly that such an approach to the solution of the problem conflicts with the complex use of raw material resources. (This is considered in greater detail in the article by M.A. Mukhtarov, Sh.Sh. Urgalieyev, S.I. Tyutebayev and B.V. Koliyev presented in this journal).

We asked deputy director of KazNIIGiprofostor for science Ye.S. Bugenov to give his opinion concerning the problem of the use of Dzhanatas phosphorites.

There is no doubt that we should use what nature gives most completely and rationally. However, today's technology of production of yellow phosphorus dictates additional requirements for the quality of phosphorites. Regrettably, research studies of the effect of lithological varieties on the technological process have been developing only most recently. A geomineralogical sector was established at KazNIIGiprofostor. But what is its function? It is duplicating the functions of plant laboratories, studying the composition of ores shipped from the mines. It seems to us that scientists should be engaged in this directly at the raw material base.

An argument in favor of such an approach is the fact that the present extent of study coverage of the Karatau ore stocks does not permit substantiation of the requirements for raw material and this means it does not permit prediction of its technological properties.

F.F. Sandt, candidate of technical sciences, head of the central laboratory of the Trade Union "Karatau" says:

"Only eight of the 45 deposits of the basin have been prospected in detail. Even during this, the technological properties of ores in respect to electrothermic processing were not determined. For many of these, the appropriate semi-industrial tests for suitability for industrial production were not conducted in general. A study of the ores of the prospected

deposits involved only determination of the capacity and the spatial disposition of productive seams, a detailed determination of the percentage content of 3 or 4 basic chemical components and an amalgamated description of the structures and textures of the ores.

Naturally, this is inadequate for an evaluation of the suitableness of the ores for electrothermic conversion, without even considering possible new processes for their industrial processing. Therefore any additional limitations on chemical components will require reprospecting of the already prospected deposits. This, as is well known, is expensive and time consuming. Now, it is necessary to reconstruct radically the practice of conducting detailed prospecting and perform complete determination of the chemical composition and all known distinctive properties of ores. Later this will permit inclusion of corrections in requirements for phosphate raw material and will help in the search for new promising means and methods of processing it.

Karatau Basin has moved into first place in the country in overall known and prospective supplies of phosphorus-containing ores. The ever arising problems of the raw material base deserve at least a doubling of the scientific research efforts devoted to them.

In finishing our conversation concerning the quality of the raw material, we must emphasize the imperfection of the technology of delivery, storage and use of the phosphorites received at the association. Thus, there still has not been introduced a progressive method of maintaining the averageness of the ore which involves the use at gallery warehouses of a system of automatic regulation of bin averaging (SARBU). There is still no precise demarcation of warehouses for reception and storage according to forms of raw material. There still exists a possibility of mixing components in random proportions. They more frequently depend upon the bulldozer operator who places the ore in the bin than on the technology. There is no use of precise nuclear-physical methods of analysis of the ores before loading them in the bins in the furnace section. All of this reduces the operational efficiency of control of the technological process in the electrothermic furnaces.

However, the main issue in the raw material problems was, and still remains, the absence of deep thermopreparation of the phosphorites.

What Is Best?

Science has demonstrated and practice has confirmed that the end result, the production of yellow phosphorus, depends upon the high-grade thermic preparation of the phosphate raw material. When we asked F.F. Sandt whether the existing requirements for raw material ensure its suitability for industrial production, we obtained a direct answer:

"In the absence of appropriate thermopreparation, no. Deep annealing in combination with the process of screening of fine classes (in addition to decarburization roasting) presents its own barrier, impeding the admission into the furnace of low-strength non-refractory ores and thus narrows the variance interval of physical properties of the raw material, entering the ore heat-treatment furnace. In demanding harsher terms of technological conditions for the raw material, the Chimkent workers are testifying to the fact that they have practically abandoned the link of thermic preparation."

What is the true state of affairs for this decisive section? Chief technologist of the association Yu.V. Shkarupa discusses this.

"The scheme of thermal preparation of the first production in which lump phosphorite is processed in a mixture with pellets on belt roasting machines has not justified itself. Because of wedging of the lump material, the machines frequently fall into disrepair. The decarbonization process is weak (10-30 percent). This produced increased sludge formation during phosphorus production. In our opinion, the fault lies with the entire construction of the machines, on which we cannot fire the entire layer of raw material."

The situation is more complex in the 2d production, Yurii Vasel'yevich continues. Here 3 slotted-shaft furnaces are installed. However, they have not operated at the designed regime. Furnace No.3 was renovated but once again the required firing temperature (950-1050°C) was not achieved. Thus, neither the belt roasting machines nor the slotted-shaft furnaces provide suitable preparation of the raw material in all of its aspects: decarbonization, mineralogical blending, blending of the granulometric composition, dust removal, etc..

Some explanation is required here. Since the beginning of development of the domestic phosphorus industry, drawing and design organizations have been introducing new technologies of thermopreparation, and selecting the most optimal version. As a result, we observe, at one plant, two different methods of primary processing of the raw material. All of this would be logical if they were tested under industrial conditions before introduction.

Talking with the designer of the slotted-shaft furnaces, head of the heat engineering department of LenNIIGiprokhim /Leningrad Scientific Research Institute for the Planning of Plants of the Basic Chemistry Industry/ M.Sh. Islamov, I asked:

"Mansur Shaikhovich, why do you consider your own creation the most applicable for the thermoproparation process?"

"Slotted-shaft furnaces are the simplest and most reliable."

"But you know they still cannot ensure high-quality thermopreparation of the raw material since they have not gone beyond the design regime."

"Renovation of furnace No.2, which is now being conducted in the association, will make possible elimination of specific deficiencies."

Renovation. Alterations. These words have become mainstays in the lexicon of the Chimkent chemical industry workers and have become pivotal during compilation of different letters and applications. Behind them are concealed miscalculations and derilictions of duty of designers, constructors and scientists. And even more -- thousands of tons of unproduced phosphorus. Take, for example, those same slotted-shaft furnaces.

The renovated furnace No.3 was in service only 2 months (March and April 1979). In the middle of May, it accidentally went out of service. Now, furnace No. 3 awaits its turn for a new renovation, while furnace No.2 is presently being renovated. Moreover, the reassembly, installation and preparation for operation of a single slotted-shaft furnace requires at least 3 months.

So, here we are still merely dreaming about high quality thermal preparation of the raw material. Existing technology does not facilitate this. It is no accident that the chief production process engineer appeals to the experience of the champion in progressive, high-temperature ore processing of Karatau phosphorites (the Novodzhambul Phosphorus Plant). He, as many others, sees the development of synthetic raw material as the answer to the heat treatment problem. However, even in 1971, the complex brigade of the Minkhimprom SSSR /Ministry of the Chemistry Industry, USSR) substantiated the advisability of deep thermal preparation by means of agglomeration or preparation of pellets. However this was not followed by practical use at operating enterprises and the head institute of LenNII Giprokhim is being occupied, as before, in experiments on slotted-shaft furnaces.

It is time for the "Soyuzfosfor" association and the Minkhimprom, USSR to listen to the opinion of the Chimkent chemical industry workers and to create a unified technological procedure with the use of synthetic raw material -- pellets. Only this version, already tested in world practice, will solve all of these cardinal problems associated with the complex use of Karatau phosphorites.

The large yield of slag must also be considered as a technological shortcoming. It now constitutes 15-20 percent. In other words, thousands of tons of yellow phosphorus are lost annually.

The association production-process engineers associate the significant increase of slag formation with the worsening of quality of the silicon-phosphate raw material. The basic cause lies elsewhere. The quantity of slag depends, first of all, on the thermal preparation of the phosphorites, the accuracy of compilation of the charge, the performance of the technological process in the furnaces, the efficiency of operation of electrofilters, in a single word, in precisely what the technologists of the association should be engaged in doing. However, a great many facts indicate that the technological discipline at the enterprise is being violated and the operational parameters for the ore thermic furnaces are not being observed. How, for example, is it possible to avoid slag formation if, of the two systems of electric filters, to our sorrow, one operates haphazardly? Or, as we already said, when the bulldozer operator and not the production process engineer decides the question of blending the raw material.

Undoubtedly, all of these shortcomings impede fulfillment of the production plan and the sale of output.

The Reliability Of Backup Organizations

Without creation of a firm, reliable backup organization, we cannot expect production successes. The resolute striving for high phosphorus production should be reinforced by well coordinated work of all backup services. However, just one such service, the mechanical repair service, has, for a long time, caused the most serious concern.

This concern is well founded. Judge for yourself: the repair base was created at the opening of the enterprise and remained at the same level and you know the cost of fixed capital since that time has increased more than 6 times. The present capacity of the repair shop provides only 25-30 percent of the overall requirements for spare parts and non-standard equipment. Deputy chief mechanic of the union I.P. Zhogalev tells about this in greater detail.

"The enterprise is equipped with unique technological equipment. It requires careful handling and daily preventive maintenance. However, our repair personnel are occupied only in the elimination of the causes of different unplanned shutdowns. The main contractor for capital repair (the Chimkent Works-and-Buildings Department Installation Administration 1 of the "Kazakhimremstroymontazh" trust) not only does not have its own

production base but does not even have its own tools. We are forced to supply it with spare parts and gear necessary for work which, obviously, cannot always be done.

Moreover, the stock of machine tools in the repair shop is inadequate. In spite of the fact that the coefficient of interchangability of equipments was brought to 1.6, repairmen could not ensure production of a minimum of spare parts. Thus, under a plan of 1.6 million rubles, a total of only 400,000 is being produced. The situation is being aggravated by the fact that a basic part of the stock of machine tools is obsolete. The shop began operations in 1964 and its equipment now is practically the same as then.

"The small repair workshops," continues Ivan Petrovich, "are basically production-process shops. The inadequacy of their equipment may be judged by the fact that they are undersupplied by nearly 100 metal lathes in new items alone."

"We are placing all of our hopes on the new South-Kazakhstan Repair Plant (YuKRZ). Regrettably, erection of it is being delayed from year to year."

Yes, the prospect of Chimkent chemical industry workers obtaining, in the very near future, a major (with sale of retail production of 18 million rubles) modern plant for repair of chemical equipment is hazy although, according to plan, it should be placed in operation in 1980. Here is why. There was a prolonged quarrel concerning the location of the future plant. And finally everything was settled and KazNIIGiprofosfor began preparation of the working drawings.

The low capacity of the repair base is having an effect upon the financial affairs of the association. Each part ordered on the side becomes three or four times more expensive. Orders must be placed not only in our own oblast but also throughout all of Kazakhstan and even in neighboring republics. The suppliers sometimes completely avoid production of scarce parts.

In this plan, a helping hand may come from the new mechanical-repair plant of the Dzhambul industrial association "Khimporm."

"Yes, we are obliged to help our neighbors, the Chimkent plant," declares deputy director general of the association, M.D. Atabayev. "But, we actually have no such plant. To date, we are ready to receive equipment of a shop with an open area of 10,300 square meters. There is a shortage of more than 300 metal lathe units. Therefore, we can scarcely manage

with the present number of machines and fill orders for spare parts for Dzhambul enterprises of the chemical industry.

"A special concern," Mukhan Dzhumagaliyevich says later, "is the state of affairs at the construction of the casting shop. It should have been in operation in the past year. However, with an annual plan of construction and installation operations of 4 million rubles, the general contractor "Dzhambulkhimstroy" has mastered 10 times less. The builders have performed even worse this year."

It appears that the Chimkent chemical industry workers must wait for better times. No. There are reserves for improvement of the work of repair personnel and those in the association simply ignore them as they ignore the order of the minister of the chemical industry, issued in 1973. We are talking about intra-plant centralization of the repair service, which conducts ordinary maintenance. As practice shows, the production of shop repair men is two times and even three times less than, say, that for ChRSMU-1 workers.

Thus, it is possible to increase the capacity for production of spare parts. This will require the removal from production-process shops of 85-90 percent of the metal lathes and the installation of them in a newly constructed repair base building. According to calculations of specialists, this measure will make possible the increase of the load factor of the lathe pool, on a 2-shift operation, from 0.4 up to 0.7-0.75 and to increase the annual output volume of production of the repair shop up to 4.5 million rubles and with the introduction into operation the YuKRZ (South-Kazakhstan Repair Plant), the level of provision of spare parts to the association will reach 85-90 percent of the overall demand.

Of course, there are many difficulties on the path to centralization of the repair service for such an important enterprise, with different conditions of operation, as the "Fosfor" association. Let us return to the order of the minister on ordinary repair. Everything in it is well organized and its economic advisability is confirmed. But the well prepared document was not followed by practical work: execution and control.

Discipline Is The Solution

There is no doubt that Chimkent chemistry industry workers function under complex conditions. However, objective difficulties, which restrict the increase of basic production became, for the directors of the association, a unique screen behind which they conceal their own wastefulness, passivity and we must say directly, the indifference to the fate of the plans and socialist obligations. You know, 3 years ago the plant operated harmoniously. It was considered a progressive plant in the sector and the conditions at that time were the same as they are today.

However, there are two basic productions which manufacture yellow phosphorus and they publish different indicators under the same situations. In order to present this graphically, we shall present results of their activity for the first half of the 4th year of the Five-Year Plan.

The collective of the first production fulfilled the program for the 6 months by 100.9 percent. Labor productivity here rose by 3 percent over that for the same period of last year. The collective of the second operation fulfilled the 6 months plan by only 79.1 percent. Of course, the labor productivity assignment was wrecked.

In explaining the causes of this obvious disproportion in realization of reasonably distributed programs, we frequently heard from directors of the association, "The situation here is simple -- the first production was commemorating their 13th anniversary. Naturally, time had united them into a friendly, harmonious collective with good traditions, one of which had become the systematic fulfillment of socialist obligations. Meanwhile, the collective of the second production came into existence with the start up of the second turn of the plant, that is, in 1974."

We can scarcely agree with such an explanation. Five years is an adequate amount of time for formation and establishment of a collective. These arguments of directors, in essence, constitute the acknowledgement that the instillation in the workers of the spirit of responsibility for putting the plan in action is not being accomplished here.

In order not to be speaking without evidence, I shall present some figures and facts.

There were 2136 lost work days in the association in only the last 6 months. The lion's share of the loss was from yellow phosphorus shops, which came from the second production and which constituted 565 man-days.

Of course, any infringement of labor discipline entails unsatisfactory conducting of the technological process, disruption of the shift quota of the entire collective and, in addition to this, accidents such as that, for example, which occurred at the beginning of February in the thermal preparation shop of the second production. Here, because of the absence on the shift of only a single worker from the attending personnel of the 10th weighing station, there were significant errors in phosphorite output. As a result, two shops were shut down.

Here is another example. In June, because of the negligence of an apparatus operator of the yellow phosphorus shop of the second production, there was an oil leak in the 9th electric filter. The down time of the furnace was nearly 30 hours. All of this cost the enterprise financial loss.

Were these cases investigated by the shop committee? Were the guilty ones punished? No. Although, by the way, we know that 86 workers were dismissed as punishment for shirking their duties in the first half year alone.

So, here they are trying to improve labor discipline by extreme measures instead of active everyday educational work. It is understood that such "rigorous" actions affect the turnover of personnel: for the 6 months in the association, 1060 persons were hired and 1132 were dismissed. These figures once more indicate the necessity for a prompt change in the approach to the education of workers.

Let us return to the second production. Is it possible that the administration and the Trade-Union Committee did not investigate the matter of the lagging behind of the collective, did not assist it to recover. They are helping. There is a frequent replacement of supervisory personnel. Since the creation of the second production, there was replacement of 5 chiefs, dozens of foremen and crew leaders. Certainly, such reshuffling is no more than half a measure, which, incidentally without specific, skillful assistance only compromises the new directors of production in the eyes of the collective.

However, the association can deal with the matter seriously and skillfully direct people to the solution of important problems. Now, as we said above, installation of the renovated slotted-shaft furnace No.3 is underway. This item was announced as a shock measure and is placed under special control of the Party Committee and the board of the association. The staff is being organized. In a word, everything is being done to place the furnace in operation ahead of schedule.

The moving force, as is well known, is socialist competition. It is assisting in the discovery and the bringing into effect of intra-produc-production reserves.

Regrettably, the organization of mass, efficient labor competition is restricted in the "Rostor" industrial association. This is especially true of the second production. It is true there is pretense, including slogans, placards about competition. But we questioned several dozens of workers and no one clearly could explain the essence of the supposedly widely subscribed to initiative of Rostov inhabitants "Work Without Falling Behind."

Meanwhile, the experience of organization of effective labor competition is straight forward, in the first production. It is noteworthy that the instigators of the initiative of the Rostove inhabitants in the association as well as other valuable undertakings was precisely this

progressive collective. Here is set the everyday control of the course of realization of socialist obligations. This permitted a marked increase in the exactness and responsibility for observance of a definite labor rhythm and a strict fulfillment of technological regulations.

Schools of advanced experience acquired great popularity on the first production. One of these is supervised by senior apparatus operator, bearer of the Order of Labor Glory 3d degree, Vladimir Yermolayevich Lyubchenko. They told us with unconcealed pride that chemical industry workers came from Dzhambul and Tol'yatti to adopt his progressive ways and methods of labor. He taught the guests to reduce to a minimum down-times of furnaces not provided for by the plan and to increase their productivity.

The guests are coming. They are gaining experience. This is very good. But why are V.Ye.Lunchenko's progressive ways and methods not being adopted in the lagging behind second production?

When they say "inner resources" they most often understand this to mean people. In them actually is hidden inexhaustible forces and strength. In order that these forces are used with maximal productivity with the greatest efficiency (for the glory of these very people themselves) organization is required. It, in essence, seals the fate of all plans. Regrettably, this organization is lacking in some subdivisions of the enterprise.

Do they know about the shortcomings in the operation of the Chimkent production association "Fosfor" at the USSR Ministry of the Chemical Industry and the "Soyuzfosfor" association? Of course they know. But effective, purposeful measures for improving the organizational work at the enterprise are not being undertaken. Here they are taking the easy and furthermore, harmful to the collective path -- correcting the plan assignments by reducing the indicators. Thus, in only the first half of the year, the planned volumes of production and sale of output were changed six times.

The restoration of its former glory is possible for the enterprise only if, in the near future, there is elimination of the gaps in the complex, effective use of raw material, in the technology of production of the end product and if the production capacities are developed completely and their output increased, and if the problem concerning creation of the required repair base is solved more quickly. The increase of the attention to socialist competition is of utmost significance. All of

this should pursue one goal -- the unconditional fulfillment of the plan assignments, the increase of efficiency and the quality of operation.

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TECHNICAL RE-EQUIPMENT OF NITROGEN PRODUCTION IN THE UKRAINE

Moscow EKONOMICHESKAYA GAZETA in Russian Nov 79 p 16

[Article by V. Galkin, instrument control man of the nitrogen production association and deputy of the UkSSR Supreme Soviet: "Technological Progress: Aiming at the Future"]

[Text] During the current Five-Year Plan a heavy-duty machine with a capacity of 41,000 tons of ammonia per year manufactured by Soviet mechanical engineers was put into operation in our nitrogen association. Compared to the old equipment labor productivity on it is six times higher, and the production cost is nearly two times lower. One thousand four hundred kilowatt-hours are saved in the output of a ton of ammonia.

We mastered the unique machine in one month. When I reflect on why we succeeded in squeezing through ahead of schedule, I see several reasons, mainly the high qualifications of the workers and specialists. Of course, this did not develop by itself but resulted from training the labor force at our university of technical progress. There chemists from the Northern Donets Basin acquire the trades of computer repairmen, instrument-makers, mechanics and production engineers. Departments for shift supervisors and skilled workers, instructors, efficiency experts and public accident protection inspectors are in operation. More than 1,100 persons are taught at the university annually. In addition a branch training center has been created within the association for training personnel to service large unit capacity ammonia machines at allied enterprises.

This is one of the conditions for the quantitative and qualitative growth of production in our association. In addition to the goal set, we have manufactured products worth R 5.5 million, including more than half a million tons of mineral fertilizers for agriculture, since the beginning of the Five-Year Plan. One of the main factors is technical re-equipment.

Modern, highly automated, economical, new machines have been and are being built; active shops are being renovated. The association collective is switching gradually from simple, partial improvements to the comprehensive

solution of increasingly complex technical problems of scientific-technical progress.

I do not know one plant, shop or section where such work--connected in one way or other with technical re-equipment, with the improvement of labor conditions and the sanitation of the environment--is not underway. Since the beginning of the 10th Five-Year Plan 119 major measures of scientific and technical progress have already been implemented at the enterprise.

The comprehensive approach to the solution of technical problems bears a great yield. It is precisely thanks to such an approach that two dilute nitric acid units with a capacity of 240,000 tons per year (labor productivity here is more than 47.5 percent of that of the former plant) and a complex for production of (AG) salts and adipic acid were mastered in short periods of time. The difficulties in mastering the planned capacities for large-capacity methanol and sebacic acid units have been successfully overcome.

I should like to talk specially about the latter machine. The progress in obtaining sebacic acid has no analogs either in Soviet or foreign practice. It is based on electrochemical synthesis and eliminates a scarce raw material--castor oil.

The production workers' successes rest upon a close relationship with scientific research and planning institutes. More than 100 economic contracts were concluded with them during three years of the Five-Year Plan for help in introducing progressive technology, new apparatus, catalysts and other innovations. The economic effect of the realization of these contracts is already as much as tens of millions of rubles.

The extracolumnar method of restoring the catalysts of ammonia synthesis may serve as a characteristic example of the "science-design-production" relationship. The new method was developed by scientists of the Institute of Physical Chemistry of the UkSSR Academy of Sciences and the State Institute of the Nitrogen Industry and Products of Organic Synthesis (GIAP). A number of investigations were conducted at the Moscow Chemico-Technical Institute imeni Mendeleyev, at the Dneprodzerzhinsk and Northern Donets Basin Nitrogen Associations. A group of scientists and engineers conducted comprehensive studies involving obtaining data for planning, creating and operating experimental industrial units.

What have the major innovations given us production workers? Previously 11 days were required for restoring the catalysts in the columns for synthesis of ammonia. And all this time both the synthesis shop and all shops interfacing with it ran idle, consuming energy. Now, however, the columns begin to produce ammonia in two days.

The automated control system [ASU] is having an increasingly clear effect on the technical growth of the enterprise. Today the ASU is solving more than 260 problems of an organizational-economic and production nature. With use of the ASU the solution of the problem of increasing product quality has been speeded up. In carrying out technical measures and also in developing the competition started by the administrator of the lactam shop, L. S. Sorochinskiy, under the motto "A certificate of product quality for each product," the collective of the association brought the number of types of products certified for the state emblem of quality to 25 and their proportion to the total volume of production, to 47 percent.

The Northern Donets Basin chemists greeted with great satisfaction the decision of the party and the government concerning the further improvement of the economic mechanism. The measures called for will accelerate the development of new types of products and progressive technology and their rapid assimilation in production.

As for the Northern Donets Basin Nitrogen Association, great problems remain to be solved in this direction in the immediate future. The course of technical re-equipment of production is continuing. On the basis of scientific-technical progress, it is planned to increase the capacities of many plants and to master the output of new types of products before the end of the 10th Five-Year Plan and during the 11th Five-Year Plan. Extensive work on environmental protection will be carried out, including the prevention of any pollution whatsoever of the Northern Donets River. The working conditions, everyday life and rest of the workers of the Northern Donets Basin will be considerably improved.
[67-9380]

9380
CSO: 1841

ESTABLISHMENT OF CHEMICAL COMPLEX IN SIBERIA RECOMMENDED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 6 Oct 79 p 1

/Article by V. Popov, doctor of economic sciences, and V. Tumin and Yu. Fridman, candidates of economic sciences, Kemerovo: "Potentials of Large-Scale Chemical Industry"/

/Text/ At present the chemical and petrochemical industry is being developed on a preferential basis in the country's European regions, whereas the basic sources of raw materials are located in the east. As a result, for every ton of polymer output produced in western regions up to 10 tons of conventional fuel are transported from Siberia, which leads to considerable material expenditures. In the near future transport expenditures will reach 500 million rubles.

However, the matter is not confined to transport costs. Fertile land in western regions is withdrawn from agricultural turnover for chemical facilities. Their ecology deteriorates. Furthermore, it should be taken into consideration that the Siberian region accounts for more than one-third of the country's water resources. In that region there are nonagricultural areas suitable for the construction of chemical enterprises. Finally, quite powerful construction organizations are already being formed in the regions of possible concentration of chemical and petrochemical production facilities.

Today Siberia produces only about 9 percent of the chemical output. In the last few years this ratio has hardly changed and in a number of important products from 1965 through 1978 the "Siberian share" was even reduced: by a factor of 1.6, in the production of synthetic resins and plastics, by a factor of 1.4, in the output of chemical fibers and in one-half, in the output of mineral fertilizers.

Now let us compare the geography of production with the distribution of raw material resources. More than 75 percent of the fuel reserves are concentrated in Siberia and only 10 percent, in European regions. Siberia has a large amount of nearly all types of raw materials needed by chemistry and petrochemistry, including the most efficient, that is, byproduct and natural gas and gas condensate. Suffice it to say that by the end of the

11th Five-Year Plan from the byproduct gas and gas condensate of West Siberia the Tobol'sk Petrochemical Complex can obtain more monomers and rubber than produced by the entire domestic industry in 1975.

It is important to note that Siberian resources are not only considerable and diverse, but also have a high point concentration. This means that it is possible to obtain considerable savings of transport costs for the conveyance of source materials. For example, the plan of the Tobol'sk Petrochemical Complex hardly utilizes railroad transport for providing basic production with raw materials. For the sake of comparison we will state that the bulk of the raw materials is delivered to the Nizhnekamsk Petrochemical Combine by railroad.

It can be stated with confidence that in Siberia there are objective conditions for the development of a powerful chemical and petrochemical complex.

The Institute of Economics and Organization of Industrial Production of the Siberian Department of the USSR Academy of Sciences together with the Tyumenskaya Oblast Party Committee held an all-Union conference in Tobol'sk last November. Workers at the USSR and RSFSR state planning committees and at some ministries took part in it. The conference considered it advisable to establish in Siberia large-capacity facilities for the production of synthetic rubber, plastics, synthetic resins and chemical fibers with a view to increasing their share in all-Union production to 30 or 50 percent. Furthermore, the conference recommended the development of the production of plastic pipes, polymeric building and heat insulating materials, films and polystyrene for its own needs. Since in Siberia there are local raw material resources, at their base it is profitable to create capacities for the output of phosphorus and potassium fertilizers, which today are transported from the west, as well as to build large-capacity units for the production of protein and vitamin concentrates.

These are general recommendations. With regard to distribution, in the western regions of Siberia there are exceptionally favorable conditions for the development of the production of synthetic rubber and polymerization plastics. In eastern regions it is possible to obtain the cheapest organochlorine products in the country. Latitudinal specialization is also advisable; for the regions north of the Trans-Siberian main line, in initial petroleum and gas refining and for the regions south of it, in the final stages, where more people are employed.

Increase in the intensification of production, as compared with the average sectorial intensification, is the decisive factor ensuring an efficient development of the Siberian chemical complex. At present the chemical enterprises operating there in their technical level do not differ from similar enterprises in the country's other regions. Often this level is even lower than the average sectorial level. For example, ammonia production facilities with the most backward technology based on the gasification of solid fuel remained only in Siberia. Obsolete flow diagrams

are used in the production of a number of products at the Krasnoyarsk Synthetic Rubber Plant and at the Azot (Kemerovo) and Khimvolokno (Barnaul) production associations. Hence the high cost of the products produced at them.

Probably, the formation of chemical units should be based on the special "Siberian" technology and equipment. In practice, chemical facilities in the country's various regions are usually established according to a unified model with some modification in the heat insulation design. With the relatively small scale of the sector's development in eastern regions this was economically justified. At the present stage and especially in the future the need for technical policy differentiated according to the country's zones is ever more obvious.

The results of investigations show that the high efficiency of Siberia's chemical complex is connected primarily with the development of large-capacity equipment and industrial processes with few stages and with a high degree of mechanization and automation of production in this region. The Tobol'sk Petrochemical Complex can serve as an example of such an approach. Original highly efficient single-stage processes developed by Soviet specialists are used in the production of basic types of products at it. Installations of a large unit capacity are used. Owing to this, the planned labor productivity there is three times as high as at similar production facilities of the present flagship of petrochemistry--the Nizhnekamsk Petrochemical Complex.

It is advisable to limit the distribution of small-capacity production facilities in Siberia. Unfortunately, in the last decade this requirement was often ignored. A large number of small-capacity production facilities appeared. Their establishment, which in its essence contradicted the technical and economic specificity of Siberia, had an unfavorable effect on the efficiency of the entire local chemical complex. The Usol'ye Khimprom Production Association proved to be especially attractive for the placement of small-capacity production facilities. A whole group of them was established at it. The low economic work indicators of this enterprise for a number of years are largely due to this.

Nor can we ignore the characteristics of the Siberian region, which often are not taken into consideration when new enterprises and production facilities are planned and existing ones are reconstructed. With the arrival of cold weather, usually, Siberian chemists face additional difficulties. Chemical apparatus and pipelines located on open ground freeze. In these cases people have unkind words not only for the weather, but also for installation men--for insufficiently good insulation--and very often for both planners and designers, who in their studies did not make a correction for the climate.

A study of the climatic and other characteristics of Siberia during the establishment of new chemical facilities can and should be organized right now. Scientific research and planning organizations are to play an

important role in this. As yet, however, there are very few of them, that is, Siberia accounts for less than 2 percent of the all-Union number of specialists employed in these organizations. Despite the fact that the majority of subsectors of the chemical and petrochemical industry have already been formed there, a number of head planning organizations of these subsectors do not have Siberian affiliates. It is not surprising that planned solutions for many facilities are worked out by organizations located in the center of the country. This hampers authors' supervision and delays the coordination of changes in and supplements to plans.

Siberia as a region and its chemical industry have vast, heretofore unutilized, potentials. Their mobilization will give a great deal to the country's national economy and, as we see, additional capital investments in excess of those planned for the sector's development, in practice, will not be needed. The latter circumstance should be considered especially important when determining the strategy and tactics of further development of the country's chemical and petrochemical industry.
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CSO: 1841

CONSTRUCTION LAGS AT DNEPRODZERZHINSK CARBAMIDE PLANT CRITICIZED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 19 Oct 79 p 3

[Article by G. Ovcharenko: "Resigned to Defeat"]

[Text] "You want to know about Dneprodzerzhinsk Carbamide?" V. Slyshko, the chief engineer of the Dneprometallurgmontazh Trust queried and then sharply drew the edge of his palm across his neck. "That's what we think about that carbamide!"

As it turned out, during the present year the organizations of the trust, mainly the Khimmontazh management, were supposed to have assimilated approximately R 2 million here and to have turned the complex over to the chemists of the local nitrogen association. You will agree that this is no small amount. But according to the calendar it is mid-October, and the assembler mechanics have assimilated only somewhat more than R 300,000. And even that went for laying piping along the working intershop scaffolding. Work directly on the project under construction has not been started, however, and it is unknown when it will be begun: the readiness for construction is null.

The position of the republican planning organs is most surprising. They programmed the capacities of the Dneprodzerzhinsk Nitrogen Association without regard for either the norms for duration of construction or for the real resources of the local base of the construction industry and the general contracting trust Dneprokhimstroy. Consequently the ammonia complex was delivered with a delay of one year. When the erection of the carbamide unit at full speed was already expected under the plan, the builders were still doing crash work on ammonia.

Did they know about this at the republican gosplan when they approved the commission of the carbamide complex for the present year? Undoubtedly! But no one here undertook to make a sober evaluation of the situation that had arisen and to plan practicable deadlines for the start-up of operations.

The builders are not hiding behind the screen of such "objective" causes. Hence the calm that reigns now over the projects of the complex and the quiet tone in which the deputy administrator of the Dneprokhimstroy Trust, V. Bogomazov, carefully enumerated for me the "objective" causes of the lag. He says, we builders had nothing to do with it, the planners have forced us to our knees.

"But this is all in the past, isn't it," I objected. "And what are you doing today to correct the situation?"

"In order to speed up work," Valeriy Aleksandrovich boldly replied, "two construction trusts, Dneprovskpromstroy and Dzerzhinskstroy, have been equipped. So we are doing everything within our powers."

Is that everything?

According to the plan approximately 800 Dneprokhimstroy workers are supposed to be working on the site. According to V. Bogomazov, more than (take note of this!) 300 are now at work. In fact, however, I counted less than 100. And Dneprovskpromstroy and Dzerzhinskstroy, which were "equipped" two months ago, have not started work at all.

Moreover, the general contractor selected a rather strange strategy for a construction start. The trust's main efforts were by no means focused on the three units of the complex which resolve the fate of the start-up but where it would be possible to "snatch away" large amounts without special effort.

After this is it any wonder that the planned goals at the carbamide complex have still scarcely been 50 percent fulfilled? And this at the same time that V. Bogomazov, the general contractor, no longer feels any need for labor resources. So what is the matter?

"The builders simply gave up on carbamide," a brigade leader of the Dneprometallurgmontazh Trust, S. Yarovoy, a bearer of the orders of the Red Banner of Labor and the October Revolution, gave me his viewpoint. "I can't understand them. So, o.k., the complex can't be delivered this year. But just the same, in order to obtain a product essential to the country as fast as possible, the attitude toward the construction project must be radically changed."

I have been on the construction site more than once. And each time I was amazed: there were neither stands showing who was working and how nor socialist pledges. There were not even the posters usual at any construction project calling for speeding up the rate of work and finishing it on time. It looks as if S. Yarovoy is right: the builders have resigned themselves to defeat. Yet today it depends on them alone whether the assemblers will be able to start work and how fast the carbamide production complex at the Dneprodzerzhinsk Nitrogen Association can

become operational. And this fact cannot be hidden behind any "objective" causes.
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NEW SODIUM SULFATE PLANT

Moscow SOTSIALISTIDHESKAYA INDUSTRIYA in Russian 11 Nov 79 p 1

[Article by V. Vol'nov: "They Kept Their Word"]

[Text] The November demonstration of workers in the village of Bekdash, located in the outer portion of northwestern region of the Karakum desert, was opened this year by the CMU-2 collective of the "Turkmenkhimstroy" combine and its contractors. Under difficult weather conditions, and in spite of many difficulties in getting supplies of materials and equipment, the builders managed to keep their word: they introduced a new sodium sulfate production facility at the association "Karabogazsul'fat" one and a half months earlier than anticipated by the plan.

After the first product was obtained on this new technological line, and after the state commission signed the document, the last meeting of the operational staff of this construction was held. Towards the end of the meeting I asked some of the members of the staff to comment on the event. Their comments follow.

V. Grishchenko, chief of staff, general manager of the production association "Karabogazsul'fat":

"In the life of our collective, the timely introduction of the new unit is the most emotional and happy occurence of the last years. Frankly, it was hardly possible to hope that the builders would complete such a difficult task in time. But they disspelled our doubts with well organized labor, full of self denial.

When this new potential is mastered, and I think that it will be in the first quarter of next year, the total output of sodium sulfate by our plant will be among the highest of the domestic production of the Minkhimprom: about 250,000 tons annually. In addition, by using this new facility, we will significantly increase production of such short supply chemical products as apsomit, bishofit, and glauber salt."

P. Dvoychenkov, chief of the Krasnovod administration of the collective "Turkmenkhimmontazh" Minmontazhspetsstroy USSR:

"First of all, I would like to note the way in which the general contractor organized the project. The builders did not look for "easy", expensive jobs, as, unfortunately, it is still done to this day on large constructions. The foundation was built not on instant gain, but on the end result."

N. Tikhomirov, chief of SMU-2 of the collective "Turkmenkhimstroy", Minstroy of Turkmen SSR:

"I came to Bekdash ten years ago. Then, there was nothing here except for some craft shops, a few houses and about twenty yurts (tents). And now, a settlement with total comfort has appeared: a completely modern township. So far, it is still a small one, but this is just a beginning.

In ten years, for the main undertaking alone, we built about 60 units for production purposes. All of them were accepted with "good" to "excellent" evaluations. Experience gained in their construction helped us in accelerating the introduction of the main facilities.

Along with a considerable advance with respect to the projected schedules, the construction of housing and sociocultural facilities took place. Characteristically, our living problems are practically solved. This played an important role in lowering the turnover of working cadres, and in strengthening work discipline.

Only one aspect leaves a bitter taste, and I must mention it. Inside this territory, all elements of Mendeleyev's table are hidden. So far, we have utilized only a very small portion of the plentiful warehouse of nature. And yet, to this time there is no scientifically based program for the development of our young industrial region. I believe that the Minkhimprom, the Soviet on the study of productive manpower, and the USSR Gosplan should provide us with a plan in the near future."

Today, the first tons of the blindingly white powder of sodium sulfate obtained in excess of the plan went to the Kaspian port by a narrow gage railroad. The builders kept their word, and for that, we owe them respect and appreciation.
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CSO: 1841

LIQUID FERTILIZER PRODUCED AT KRASNODAR

Moscow SEL'SKAYA ZHIZN' in Russian 19 Oct 79 p 2

[Article by Yu. Semenenko: "A Giant in Formation"]

[Text] Production of complex liquid fertilizers was started at the Krasnodar Chemical Plant.

Quite recently, less than three years ago, this place was vacant. Now, here near the regional township of Belorechensk, the breakthrough construction of the tenth five year plan has been completed: the Krasnodar Chemical Plant.

The section of complex liquid fertilizers, equipped with the most modern equipment, was also activated. All units were accepted by the labor commission with good rating three months prior to the projected deadlines. Construction was completed on railroad lines, on the principal structure, on the reactor, on warehouses for crude material and final products, including all the supporting services - two units with 200,000 tons capacity each, on a nitrogen gassification station, water recirculation system, etc. All units have automated modern equipment, to exclude manual labor.

Annually, this shop will produce 660,000 tons of the most effective fertilizers containing 10 percent nitrogen and 34 percent phosphorus. That which was predicted by the multifaceted agreement of February of this year between the builders and the operators has occurred. About 40 construction, assembly and finishing companies participated in the construction of this productivity giant.

Without a break, the work continued on numerous sites for many days and nights. Two and three shifts were used. Hundreds of people, united with the single goal of starting the production of material so impatiently awaited in the countryside, manifested highly productive work. Just prior to the opening date, the construction workers labored with added intensity. Several months in a row, the banner of the labor glory was raised to acknowledge the effort of the second section, SMU-56, headed by

A. S. Nogina. A. Kuteynikov, the assembly brigade of V. Menyaylov, the insulator R. Fomina, and others became heroes of the construction.

The new shop shines with cleanliness and order, as expected of a chemical installation. The director of this shop, M. N. Smolenko, is satisfied: the builders have come through, and all automatic instruments work according to specifications.

The shop collective helped the construction workers in the assembly and fine tuning of the equipment, and learned along the way, gaining valuable experience. "Already, we have mastered the daily and potential capacity by 70 percent. In the next few months we will reach the planned performance level," says Mikhail Nikolayevich.

In the "brain center" of this shop, a room with the control panel, we met the chief of the leading shift of the day, Ye. A. Shilova. Looking at the multicolored lights on the panel, connecting by steel nerves all production equipment, Evgeniya Aleksandrovna said:

"The country workers face greater and more complex tasks, and we are doing everything possible to help them in completing these tasks successfully."

The entire shop area is decorated festively. Thousands came to the meeting devoted to the opening ceremonies of this new production unit. In response to the warm greetings from Leonid Il'ich Brezhnev, the construction workers and the chemists pledged to work effectively and enthusiastically, and to master the new potentials of this plant ahead of the schedule. The participants of this meeting solemnly accompanied 20 trucks with liquid fertilizer out of the plant, heading towards Ust'-Labinsk region, where the farmers have achieved highest yields of their crops for a number of years.
[66-7813]

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CSO: 1841

GROZNYY REFINERY ON STREAM AHEAD OF SCHEDULE

Moscow PRAVDA in Russian 3 Nov 79 p 1

[Article by V. Artemenko: "The Bud of Rejuvenation"]

[Text] A large petroleum refinery, with an annual capacity of several million tons, has been activated in Groznyy, two months ahead of the projected due date.

The petroleum refineries in Groznyy have been active for about a century. Forty years ago, the equipment was updated for the last time. In the meantime, wear and tear on the equipment was considerable. On top of it, a new work load was added: the Checheno-Ingushetiya began to accept petroleum for refining from many regions. In order to be able to "crack" the incoming product quickly and qualitatively, the Groznyites decided to rebuild the existing facilities, and to construct new ones. ELOU-AVT, the electric desalting equipment with an atmospheric-vacuum piping system, represents one of the buds of the rejuvenation process at the Groznyy plants.

Today, the builders have cause for a celebration. In two years and ten months time they have appropriated 40 million rubles in capital investment at the petroleum refinery Imeni V. I. Lenin, under complicated conditions of an existing operation. The planned goals on the growth of productivity have been surpassed, labor losses were diminished. The effort of the personnel of the Checheno-Ingushetiya construction administration area of Minpromstroy USSR, of "Kavelektromontazh", of "Tsentrospetsstroy", of "Montazhtermoizdeliye", and of the Minmontazhspetsstroy of the USSR, was excellent.

The builders did not work in vain. The two months lead time on the activation date of the facility will make it possible to refine additional hundreds of thousands of tons of petroleum, and to increase production by several million rubles.

"This new facility represents one of the stages of the thorough reconstruction program of petroleum refineries and of the petrochemical industry

in our republic", said the secretary of Checheno-Ingushetiya OBKOM, CP USSR, L. Magomadov. "During the construction period, the fraternal assistance from all the peoples of the USSR and of socialist countries was evident. Here, representatives from many Union republics worked shoulder to shoulder with specialists from the GDR."

The working force of this complex facility entered the round-the-clock pre-holiday schedule.
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CSO: 1841

NEW 60,000 TON PER YEAR POLYETHYLENE PLANT PLANNED

Moscow KRASNAYA ZVEZDA in Russian 23 Oct 79 p 4

[Article by I. Kalashnikov: "Continuation of 'Polymir'"]

[Text] Polyethylene is known as the "king of plastics". Such high praise is definitely justifiable because it shows many of the leading qualities of synthetic materials. A variety of goods produced from polyethylene can be found in each household: storage containers, toys, bath tubs, cans. The practical and quite inexpensive greenhouse panels are very popular. In the cable industry, this plastic simply has no competitor in the area of insulation. Pipes made from this plastic defy corrosion, and they can be used in improved constructions. This valuable product can also be used in production of various machine parts, camparable in strength with metal products.

This material is produced at high temperatures and pressures of 1500-2500 atmospheres; only under such conditions is it possible to carry out this highly productive process with assurance of required quality. Various specialists spent a lot of time working out the details needed to assure reliable performance of the equipment under such conditions.

Several years ago, a large modern polyethylene production plant was opened in our country, at the Polotsk Chemical Combine Imeni "50th Anniversary of BelSSR". The plant, designed by Soviet and German experts, has a production capacity of 50,000 tons of plastic per year, and it was named "Polymir-50", representing the Soviet and German names of the "king of plastics": "polyethylene" and "miraten". Our own experts and those from the German Democratic Republic who participated in this project were awarded the USSR State Prize.

However, the requirements for polyethylene continue to expand rapidly, because of its use in many areas of the national economy. Therefore, the builders and the technologists continue to improve existing equipment, while designing even larger new plants. For example, a production plant "Polymir" has already been designed for the GDR with an annual production capacity of 60,000 tons. In this country, construction is planned for

several technological lines of the "Polymir" type, each with an annual polyethylene production capacity of 75,000 tons.
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CSO: 1841

NITRIC ACID PRODUCED AT NOVGOROD PLANT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 19 Oct 79 p 2

[Article by O. Fedichev: "Plant of Plants"]

[Text] The first production of dilute nitric acid has been achieved at the production plant of the Novgorod Association "Azot". One of the important goals of the socialistic obligations of this collective was achieved during the fourth year of the five-year plan. Introduction of this 380,000 tons annual production capacity plant will make it possible to double the output of mineral fertilizers.

Rightfully, this new production complex is called a "plant within a plant". [66-7813]

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SECOND LINE OF ODESSA AMMONIA PLANT PUT INTO OPERATION

Moscow TRUD in Russian 4 Nov 79 p 1

["Article by Ye. Zabortsev: "A Giant of Chemistry Put Into Operation"]

[Text] The second line of the Odessa port plant has been put into operation, outstripping the planned deadlines by three and a half months. Its capacity is now 900,000 tons of ammonia per year.

Six years ago the first builders arrived on the shore of the Adzhalyskiy Estuary. They began to build a giant of the chemical industry--the Odessa port plant. The republican Komsomol shock construction project called on hundreds of workers of the Ukraine and other republics, cities and villages of our country. The specialized port of Yuzhnyy for processing exported and imported chemical shipments and the plant for producing liquid ammonia adjacent to it were also created by their labor.

In the new port gigantic tankers moor at deep-sea moorages equipped with powerful technology and automatic machines. Fourteen heavy-freight vessels were handled by the port of Yuzhnyy in September. The diesel vessel Mayori, which has just arrived from the Baltic Sea region, has connected up to the main line. Liquified ammonia has started into its tanks in a powerful stream. And here a Greek dry-cargo ship has made fast; it takes on 12,000 tons of carbamide.

"Our longshoremen have joined in socialist competition for high efficiency and quality of work," the assistant chief of the port of Yuzhnyy, V. Khomenko relates. "From the moment the first line was put into operation 229,000 tons of ammonia have been manufactured; more than a million tons of chemical products have been loaded at the plant moorages. The present shock duty in honor of the 62nd anniversary of October is the second in the work biography of the port of Yuzhnyy.

The workers of the port factory builders' collective worked with the greatest possible speed. For it was only very recently--on theeeve of 1979--that the first unit for manufacturing liquid ammonia was put into

operation. This was a great victory, to which the party and the government paid high tribute. The start-up of the new plant's second line ahead of schedule will enable the chemists to obtain above-plan production amounting to no less than R 5 million before the end of the year and will ensure uninterrupted shipment of ammonia for export.

The port plant has begun to work full force and has reached its planned capacity. Everything is being done so that the workers of the new production complex may work and live under good conditions. Next to the factory a new, modern, chemists' settlement has gone up. Lodgings, a school, a children's center, and a department store have been built, and a polyclinic and a Palace of Culture are being erected.
[67-9380]

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CSO: 1841

NEW AMMONIA PRODUCTION FACILITY AT CHERKASSY

Moscow IZVESTIYA in Russian 2 Dec 79 p 1

[Article by G. Budanov: "Beyond This Height - Another"]

[Text] A new production complex was introduced at the Cherkassy Association "Azot", designed to produce 450,000 tons of ammonia annually.

The miraculous process of chemical reactions is hidden from the human eye. It occurs inside the complicated equipment of the just opened production complex.

The Cherkassy plant is interesting in several ways. This is a highly automated plant with excellent equipment. The success of this undertaking is based on modular construction methods, on reinforced block mounting of the construction and technological equipment, and on brigade contracting.

Competition, based on the principle of "work relay", yielded remarkable results, notes the secretary of Cherkassy Party Obkom Yu. Krushinskyy. The atmosphere of mutual assistance was appreciated most of all. While competition occupied the central attention of the party organization, the agreements among neighbors were under control of the workers.

The brigade headed by the hero of Socialist Labor, the Representative to the Supreme Council of the USSR, V. Zabolotnyy, introduced the novel relay approach. The cement molds from water resistant plywood used by his brigade made it possible to achieve a surprisingly clean construction surface, reduced losses and increased time economy.

The brigade of mechanics and assemblers, led by N. Budantsev, will always remember the days when the technological pipelines were butt joined and welded. The fiery seam was applied to 2,500 pipe joints with different inside diameters. According to standards, this job required three months for completion. This brigade did it in a month and a half.

However, a special recognition is due to the assemblers employed on special operations, hoisting oversize, heavy equipment. The normal methods, employing cranes, towers or block pulleys, could not be used. Hydraulic lifts had to be employed. A 60 meter absorbed column was placed in a preplanned position in a few hours. The participating brigades of I. Ryl'chenko and A. Kurchi saved twenty days for the construction.

The production complex "Ammiyak-450" grows stronger. Next to it, a 132 meter granulation tower is being raised. The production of carbamide, a concentrated type of fertilizer, is in the incipient stages. The Cherkassy builders are fully committed to complete this project on schedule as well. The collective adopted the rule to reach for one height after another in their work.
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AMMONIA PIPELINE: FIRST STAGE COMPLETED

Moscow STROITEL'NAYA GAZETA in Russian 12 Oct 79 p 1

[Text] The first stage of work on the Tol'yatti-Odessa ammonia pipeline construction was completed yesterday. The pipeline was filled with liquid ammonia from Gorlovka to Odessa, a distance of 815 kilometers. We asked the Deputy Minister of Chemical Industry of the USSR, V. Koval' for a comment:

-The ammonia pipeline being constructed is a unique, technically complex construction with no equals in Europe. Here, for example, for the first time, sectioning posts, equipped with ball valves, which, in case of a pressure drop in the pipeline, would automatically bridge over the segments of lower pressure, signalling shutdown of ammonia transport, have been designed. The remote control and operations of all ammonia pipeline units is achieved by means of computers.

The pipeline is designed for the transport of liquid ammonia, the most effective nitrogen fertilizer, to rural agriculture units in Southern Ukraine, and for the export of liquid ammonia through the new port facilities of "Yuzhnyy", built together with supporting facilities near Odessa. I should note that, in this year, the construction of two large ammonia plants was completed in Gorlovka, as well as facilities for the receipt, storage and loading of liquid ammonia in special tankers--the ammonia cars at the near port facilities in Odessa. The constructed segment of the ammonia pipeline joined these two complexes: through the pipeline, Gorlovka ammonia reached the Odessa port plant.

The opening of the ammonia pipeline will liberate several hundred railroad tanks and considerably lower the load on railroad transport.

Congratulations are due to the builders of Glavukrneftegazstroy, to signal men, chemists, and designers, for the first important work success. During the next weeks, the final tuning up should be accomplished on the signal and automatic control systems of the ammonia pipeline, and it should be presented to the state commission.
[66-7813]

7813
CSO: 1841

VOLGOGRAD SHOP TO PRODUCE EQUIPMENT FOR PETROCHEMICAL PLANTS

Moscow IZVESTIYA in Russian 19 Oct 79 p 2

[Article by Yu. Kanov: "Branch Flagman"]

[Text] A construction shop is being erected on the Volgograd plant Imeni Petrov for the production of giant equipment for the petrochemical industry.

Currently, most of the petrochemical industry requires large equipment. To prepare such units, giant shops are needed. One of such shops, the Boiler-Welding shop No. 6, is being constructed at the Volgograd Plant Imeni Petrov.

It raises high over other plant buildings, like an ocean liner over small boats. This new shop is about 500 meters long and 100 meters wide, covering the total production area of 50,000 square meters. Almost 10 football fields could be placed under its roof.

Among all the dimensions of this giant shop, we are interested most in the arch span height, notes the deputy secretary of the Party organization at this shop, engineer G. Chukhonastov. It is almost 12 stories high. At the 36th meter mark of the second story, a 250 ton crane has been mounted, a little further on--another, similar one. Together they can lift a load of 500 tons. An automatic thermal kiln is already operational.

We walk along the arches of this giant shop. Enormous apparatuses, resembling whale carcasses, are all around: gas holders, absorbers, various technological columns.

This gas holder was built for Cuba. And this 210 ton reactor will be sent to Yugoslavia, says Gennadiy Mikhaylovich. Ahead, metallic girders come into view. Here a unique transportation system is being assembled, the so called transborder, used for intra-shop transportation of giant apparatus. This system will accelerate the building of oversize petrochemical equipment, facilitating working conditions. The transborder will make it possible to relocate units exceeding the weight of 800 tons from one section of the shop to another.

In the well known proverb saying that if the mountain will not come to Mohammed, Mohammed will come to the mountain, the second alternative was always considered to be the more logical one. This approach was also taken here: the men used to come to the "mountain", that is towards the reactor being built, they welded the seams, they tested the reliability of the walls, etc. This obviously diminished their work productivity. With this type of work organization it was difficult to mechanize the production and even more so to automate it.

The transborder will become the connecting link of the internal conveyor. It could pick up on its transport platform a reactor and deliver it from, let's say, the welding assembly area to the betatron room, where gamma rays would be used to test the quality of the welded seams. Then the transborder could move the reactor on to the blasting and painting areas, and so on, along the entire technological line.

Currently, the maximum weight of most of the chemical equipment produced at the plant Imeni Petrov is about 250-300 tons. Opening the new shop No. 6 gives the plant the capability to produce units weighing 600 tons and more. This is about what the petrochemical industry needs now.

The size of this new unit will make it possible to unload giant apparatus in the assembled state. At this time even considerably smaller reactors must be disassembled before shipping to the desired location, where the final reassembly must take place. This takes up a lot of time and lowers the quality of the end product. Transportation of giant apparatus ready for plant operations will accelerate the assembly at the sites of petrochemical plants being constructed.
[66-7813]

7813
CSO: 1841

CONSTRUCTION OF CAPROLACTAM PLANT DELAYED

Moscow STROITEL'NAYA GAZETA in Russian 14 Sep 79 p 1

[Article by I. Khaziyev: "The Deadline Has Passed"]

[Text] The principal work load on the construction of the actuating complex for the production of caprolactam at the Chirchik Association "Elektrokhimprom" belongs to the subunits of the Uzbek SSR Minmontazhspetsstroy. From the 19 million rubles allocated for this year, they appropriated about nine million in eight months, or somewhat more than a half of what was proposed for that period.

What is the reason for this lag?

"Primarily", answers the first deputy of the republican minister of assembly and special construction projects I. Borodavko, "the problem is that the actuating complex is poorly supplied with special materials, technological equipment, and pipe lines, even though the deadlines for their delivery have long since passed.

Today we are short 40 units of technological equipment, a large number of shut-off fixtures, branch pipes, T-joints, etc.

The construction readiness of the objects built by combine No. 160 and other Minstroy organizations is very poor. Because of this, the mechanical assembly work on the pumps for the reversible water supply, work on the waste combustion unit, on reagent storage, and petroleum residue handling is delayed.

The situation is made even more complex by poor technical documentation produced by the Chirchik branch of the GIAP. A third of the working diagrams connected with pipe assembly alone had to be redone.

Seventeen hundred assembly men are working on this construction, and their number will soon reach over three thousand. Today, it is especially important to provide them with sufficient work so that this important complex of the national economy could be activated during the fourth quarter of this year.
[66-7813]

7813
CSO: 1841

BRIEFS

AMMONIA PRODUCTION--The second high tonnage ammonia unit has been put on line at the Odessa Port Plant 15 days ahead of schedule. The first similar unit was put into operation also ahead of schedule. A mechanized facility for transloading ammonia onto maritime vessels has also been put into operation. [Excerpt] [Moscow STROITEL'NAYA GAZETA in Russian 19 Sep 79 p 1]
[102-P]

CHLORINE AND CAUSTIC SODA--The first electrolyzers in the production of chlorine and caustic soda have been put on line at the Ziminskiy Chemical Plant. This marks the beginning of industrial exploitation of the richest deposits of rock salt in eastern USSR. The plant will be one of the most modern enterprises of the industry. In coming years, high capacity facilities for the production of vinyl chloride and polyvinyl chloride will be put into operation here. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 11 Nov 79 p 2]
[104-P]

SULFUR PLANT EXPANDED--L. Vinogradov, State Commission Chairman; M. Dzhumakulyyev, Deputy Minister of Construction for Turkmen SSR--
At the Guardak Sulfur Plant, the State Commission has accepted for operation the second stage of the sulfur production complex using the underground melting method. Construction, installation and operational crews have assured that the PVS-100 complex was commissioned ahead of schedule in the third quarter of 1979. [Text] [Moscow STROITEL'NAYA GAZETA in Russian 7 Oct 79 p 3]
[105-P]

AROMATIC HYDROCARBON COMPLEX--An aromatic hydrocarbon complex, the largest in Siberia, is being built in the Omsk "Omsknefteorgsintez" (Omsk Petroleum Organic Synthesis) Association. The final state of the work in delivering large equipment for the complex has now begun. Putting the new production facility on line will permit the Omsk oil refiners to considerably expand the product mix. [Text] [Moscow IZVESTIYA in Russian 25 Dec 79 p 2]
[103-P]

LIQUID PARAFFIN PRODUCTION--Kuybyshev--A complex, the first of its kind in the USSR for the production of liquid paraffins by the "Pareks" method, has been put into operation at the Orden Lenina Novokuybyshev Petroleum Refinery. Several thousands tons of the valuable product have already been obtained. Liquid paraffins are the initial raw materials in the production of protein and vitamin concentrates used to fatten agricultural animals. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 4 Dec 79 p 1]
[101-P]

UKHTA OIL REFINERY--The Ukhta Oil Refinery has attained the volume of output planned for the end of the Tenth Five-Year Plan period. In the first 4 years, its production increased 15.6 percent. Fifty eight percent of its products are put out with the State Mark of Quality. [Text] [Moscow PRAVDA in Russian 12 Jan 80 p 1]
[100-P]

REFINERY IN LITHUANIA--Adjustment of equipment has begun at the Mazheykyay Petroleum Refinery, the pioneer among Lithuanian petroleum chemists. Silvery cracking towers, where crude is refined into high-octane gasoline, diesel fuel and lubricants, were erected on a huge area. Water purification installations were readied and gas vapor traps were built to protect reliably the environment from pollution. Crude is already flowing in the Polotsk-Mazheykyay pipeline. Together with the refinery, the small town of Mazheykyay is growing; it will become the town of petrochemists and construction workers. [Text] [Moscow IZVESTIYA in Russian 9 Dec 79 p 3]
[99-P]

FERTILIZER FROM GRODNO--(TASS)--The automated complex "AMMIAK-3" (Ammonia-3) in the "Azot" Association imeni S. O. Pritytskiy was put on line at the designed capacity yesterday. It will produce 1,360 tons per day of raw materials for mineral fertilizer production. Equipment assimulation time was cut by 6 months with the help of crews from related domestic associations. The sectorial scientific center trained dozens of highly skilled operators and workers in other trades. Part of the cadres was transferred from existing shops of the association. Experience gained in the accelerated mastery of capacities on previously started-up lines will be useful. [Text] [Moscow TRUD in Russian 30 Nov 79 p 1]
[106-P]

FERTILIZER FROM NOVGOROD--A new complex for the production of mineral fertilizer with an annual capacity of 750,000 tons has been put into operation at the Novgorod "Azot" Production Association imeni 50-Letiye Velikogo Oktyabrya. Several hundreds tons of the product have already been produced. The complex includes facilities for the production of ammonium nitrate and dilute nitric acid. Machine building industries in Leningrad, Khabarovsk, Belgorod and Sum manufactured the principal equipment for the nitric acid production unit, whose capacity exceeds those now existing in the USSR by a factor of three. Annual output of mineral

fertilizer will total more than 3.5 million tons once the new complex reaches designed capacity. At present, kolkhozes and sovkhozes in 25 oblasts in the Russian Federation, the Soviet Baltic and Belorussian republics receive these "vitamins of the fields" from Novgorod. [Text] [Moscow IZVESTIYA in Russian 7 Dec 79 p 3]
[107-P]

FERTILIZER OUTPUT UP--The Tol'yatti Nitrogen Plant has significantly increased the production of fertilizer. A third high tonnage ammonia unit has been put into operation here. Fertilizer output has now been raised to 1,350,000 tons. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 3 Jan 80 p 1]
[108-P]

FERTILIZER PRODUCTION AUGMENTED--Samarkand--The second section of the Ammofos complex built at the Samarkand Superphosphate Plant has been put on stream. The annual designed production output of the new facility is 700,000 tons of fertilizer. It has been put on line in two thirds of the normal scheduled completion time. During the four months thus gained by the prescheduled completion, farmers will be provided with additional thousands of tons of nitrogen-phosphorus fertilizer. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 46, Nov 79 p 3]
[109-P]

MORE FERTILIZER--Tol'yatti, Kuybyshevskaya Oblast--The third ammonia unit with an annual capacity of 450,000 tons of fertilizer has been put into operation at the "Kuybyshevazot" (Kuybyshev Nitrogen Production) Association. This is the third large successful venture of the "Kuybyshevgidrostroy" (Kuybyshev Hydro-Production Facilities Construction Trust). In October, the State commission signed a document concerning the putting on stream of the first two ammonia units; and in December, the first carbamide facility was put on line. Our chemical industry has not yet known such high construction rates and the putting into operation of such large tonnage facilities. For the first time during the course of one year, three ammonia facilities with a total annual capacity of 1.35 million tons and a carbamide unit with an annual capacity of 480,000 tons ande put on line. [Excerpt] [Moscow PRAVDA in Russian 1 Jan 80 p 1]
[110-P]

YAROSLAVL' SYNTHETIC RUBBER--Yaroslavl--The important step of equipment replacement has been completed at the Yaroslavl' Synthetic Rubber Plant. The second stage of a large complex for the production of isoprene rubber has been put into operation. The new production facility is fully automated. The enterprise (where almost half a century ago the first kilograms of synthetic rubber were produced for the first time in the world) now produces annually tens of thousands of tons of high quality products. Radical reconstruction of this veteran of the industry, accomplished

under conditions of on-going production, and the constant modernization of equipment and technological processes made the constant augmentation of capacities possible. The production of a large number of new types of products has been mastered here. The Yaroslavl' Plant will more than double the output of synthetic rubber once the planned output levels for the isoprene rubber complex are attained. Competition for the assimulation of the new equipment is underway at the plant. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Dec 79 p 2]
[111-P]

SYNTHETIC RUBBER PLANT--Chaykovskiy, Permskaya Oblast--A synthetic rubber plant is being built on the Kama River in the vicinity of this young town. The plant is designed to process thousands of tons of raw materials annually. A central gas fractionating complex has recently been put on line here. It processes natural Siberian gas and produces the essential principal intermediate products (propane, butane, isobutane) in the production of synthetic rubber. The first lots have been shipped to users. At the same time that the Chaykovskiy industry supplies raw materials to domestic industrial enterprises, they will supply gas for household use in neighboring cities in the Urals. [Text] [Moscow SEL'SKAYA ZHIZHN' in Russian 16 Nov 79 p 1]
[112-P]

MORE SYNTHETIC RUBBER--Mass production of synthetic rubber was achieved for the first time in the world in Yaroslavl' 47 years ago. It was at the Yaroslavl' Synthetic Rubber Plant that the production of synthetic latexes, which were to be widely used in many sectors of the national economy, was successfully mastered. At the end of 1979, the first stage of a high capacity complex for the production of isoprene rubber was put into operation. Structurally the product is close to natural rubber. Its use in tires and in industrial rubber articles will give them high durability. The plant's director, B. Germanov, declared that the new facility will increase output by a factor of 2.5 and will raise labor productivity. This is an important step in the technical development of the plant. [Excerpt] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 3 Jan 80 p 2]
[113-P]

USSR UDC 66.002.4

QUESTIONS RELATING TO CALCULATION OF THE EFFECTIVENESS INDICATORS OF PLANNED CHEMICAL TECHNOLOGY SYSTEMS

Kiev KHIMICHESKAYA TAKHNOLOGIYA in Russian No 5, 1979 pp 40-41

STATYUKHA, G. A.

[Abstract] In planning complex chemical technology systems, effectiveness indicators are used, which help the planner to evaluate and select the optimal planning solution. The effectiveness indicators used are noise immunity, stability, quality of control, complexity, reliability, sensitivity, productivity, cost and a few others. Any effectiveness indicator, S, depends on technological parameters, α, effects of the environment, β, the design parameters of equipment, η, and structural parameters, γ. Thus, $S = S(\alpha, \beta, \eta, \gamma)$. Calculation of the effectiveness indicator vector with a computer requires running through a fairly complicated algorithm and processing a great amount of information, and some indicators require the introduction of special mathematical models for estimating them. Reliability is one of these. Aspects are discussed of the scientifically substantiated selection of the most representative indicators and of their inclusion in a model of the planning process for the purpose of making the optimal planning decision. In discussing the selection of the effectiveness indicators for a complex chemical technology system it is shown that is is not necessary to calculate and estimate the noise, or interference, immunity of the system. The planning of technological systems relies on the assumption that the complex's operation will take place with insignificant interference on the part of raw material flows and the environment. By the stability of the system is meant its ability to maintain its required properties under the effect of disturbances. The main problem for the system here is the existence of essentially nonlinear elements. An estimate must be made of stability when the system contains elements which are unstable by their very nature and when there are recycling processes in the system with essentially nonlinear elements. Otherwise stability, along with the quality of control, can be disregarded. A calculation is not made of complexity if the number of elements of the same type in the system is not greater than 10 and the total number of units is not greater than a few dozen. Therefore, for the majority of systems planned a determination is made of the following effectiveness indicators: sensitivity, λ, reliability, q, productivity, G, and technical and economic indicators, mainly, the system's cost, C; $S = \{\lambda, q, G, C\}$. The application of these effectiveness indicators in the planning process is discussed. It is possible to produce a definite estimate of the effectiveness of a technological complex only at the stage of its operation. At the planning stage, the indicator of the forecastable effectiveness of a system is the probability that the planned system will maintain its effectiveness at the stage of operation. This indicator, κ, can be calculated from expert evaluations, $\kappa = p^T S$, $\Sigma p_i = 1$, where p^T is the vector of the weights

attached by experts to particular effectiveness indicators. At the stage of synthesizing a chemical technology system all effective indicators can be employed; it is possible to estimate the sensitivity of a system to a change in its parameters and raw material flows, and to estimate the system's reliability and its cost, with its productivity already predetermined. Then S_{KhTS} [chemical technology system] $= \{\lambda_{KhTS}, q_{KhTS}, G_{KhTS}, C_{KhTS}\}$. The effectiveness indicators discussed here can be used in organizing and controlling research processes and in planning complex chemical technology systems.
[41-11,176]

USSR UDC 577.15

PREPARATIVE BIOSYNTHESIS OF GROUP E AND GROUP F PROSTAGLANDINS BY THE USE OF SYNTHETASE AS AN ACETONE-PENTANE POWDER

Tallin IZVESTIYA AKADEMII NAUK ESTONSKIY SSR - KHIMIYA in Russian, Vol 28 No 3, 1979, pp 145-150, manuscript received 23 Nov 78

LILLE, YU., MYANNIK, A., YAGOMYAGI, A., SAMEL', N., SAKS, T., Institute of Chemistry, Estonian Academy of Sciences

[Abstract] Biochemical methods of synthesis of prostaglandins, which are relatively unstable optically active compounds, have advantages over chemical synthesis in certain cases, since they are simple and minimize the formation of side products. This article presents results from the first stage of work on preparative synthesis of prostaglandins by a biochemical method. The true equilibrium and kinetic parameters of the formation of prostaglandins under the conditions used are not known; however, the apparent values of inactivation rate constant and catalytic constant osynthetase are sufficient to estimate the expected maximum yield of the products of the reaction of oxidative cyclization of polyenic acid. Under ideal conditions, most of the product is formed in the first stage of synthesis. The spectral and biologic characteristics indicate sufficient purity and high activity of the E_2 and $F_{2\alpha}$ prostaglandins synthetized. Figures 6, References 11: 1 Russian, 10 Western. [60-6508]

UNIFIED AGRICULTURAL CHEMIZATION SERVICE CREATED

Moscow SEL'SKAYA ZHIZN' in Russian 2 Sep 79 p 1

[Article: "Unified Chemization Service"]

[Text] The flow to the countryside of mineral fertilizers, different chemical agents for protecting plants and animals from diseases and pests, lime and gypsum-containing materials, fodder supplements and other products of chemistry is increasing from year to year. As a result the collective and state farms are receiving a powerful means of control over further intensification of agricultural production and increase in field and farm productivity. But in order for this means of control to operate at full force, the increased arsenal of agents for chemization of production must be skillfully applied, and problems must be solved in all their complexity. Unfortunately, these agents are still not being used correctly and rationally everywhere nor is the due yield being obtained from them.

In order to introduce proper order in the work of the chemization of agriculture, the CPSU Central Committee and the Soviet government have enacted a decree "On the Creation of a Unified Specialized Agrochemical Service in the Country." This decree, published a few days ago in the press, recognized the necessity of organizing an All-Union Production-Scientific Association for Agrochemical Service to Agriculture (Soyuzsel'khozkhimiya) within the system of the USSR Ministry of Agriculture. The association is being created on the basis of the subdivisions of the USSR Ministry of Agriculture and the USSR State Committee on Agricultural Technology dealing with problems of the chemization of agricultural production. In the unified system of agrochemical service the formation of self-supporting production-scientific associations in the union republics, production associations in the autonomous republics, krays, oblasts and rayons and chemization stations on farms is envisaged. Agrochemical laboratories, plant protection stations and scientific research institutions also enter into its composition.

This system is being called upon to ensure scientifically valid use of mineral and organic fertilizers, chemical and biological plant protective agents, soil improvement agents, fodder supplements, growth stimulants and other agricultural chemization agents on all collective farms, state

farms and at other agricultural enterprises; to organize the extraction of peat and local lime and gypsum-containing materials; to perform all basic work on increasing the fertility of soils, improving them chemically and treating crops with chemical and biological plant protective agents under contracts with the farms; to develop an agrochemical service network and to strengthen its material and technical base. The Soyuzsel'khozkhimiya Association is also obligated to conduct control over the quality and timely delivery to agriculture of chemization agents, reliable accounting and reporting on their use at all agricultural enterprises and also over the observance by all land-users of measures for protecting the environment from pollution by pesticides and fertilizers and over the organization of the training and retraining of the specialists and personnel of mass professions in the chemization of agriculture and in plant protection.

Taking into consideration the exceptionally important significance of chemization to the further development of agricultural production, the CPSU Central Committee and the USSR Council of Ministers made it incumbent upon the Central Committees of the Communist Party and the councils of ministers of the union republics to ensure the organized implementation o all measures related to the creation of the unified agrochemical service, the transfer of the necessary material and technical base, warehousing capacity, cultural and living accomodations and available housing to the new organs. Particular attention must be given to the selection of, and rapid staffing of all units of the service with, highly qualified personnel capable of successfully conducted the complex work of the chemization of agriculture on a scientific basis and of increasing its effectiveness.

In some oblasts and autonomous republics production or production-scientific agrochemical associations have been operating for several years. The experience of their work should be used as widely as possible For example, the production-scientific agrochemical associations in Mariyskaya ASSR, Moscow Oblast and several other oblasts are doing successfull work. Thus, the Moscow Oblast agrochemical association has service 400 farms of the oblast with a total area of farm land of 1.7 million hectares. It is independently conducting a whole volume of work on liming acid soils, almost half the volume of work on eliminating organic and introducing mineral fertilizers and more than 55 percent of work on chemical plant protection. Thanks to the increased scale of chemization of production and the rational use of fertilizers and the increase in agricultural crops, the farms of the oblast have increased the average annual yield of grain more than two-fold. Many farms and even rayons are harvesting 40-50 or more centners of grain, 250-300 centners of potatoes and 100-120 centners of straw from a hectare of plantings.

Rural workers are now engaged in harvesting the crops and are simultaneously laying down the basis for next year, which concludes the 10th Five-Year Plan. It is a matter of honor for the workers of the agrochemical service to render effective assistance to the collective and state farms so that organic and mineral fertilizers may be accumulated and applied to the fields in the necessary proportions, to teach the machine operators and

all agriculturalists progressive techniques for using chemical agents. The autumn must be used to expand work on the liming of acid soils maximally, especially in the zone poor in chernozem.

Success in the agrochemical service's work and the effectiveness of chemization to no small extent also depend on the workers of the chemical and other branches of industry which supply agriculture with fertilizers, technology, materials and equipment. They are urged to increase production more rapidly and to increase the quality of fertilizers, herbicides, various preparations, techniques and equipment for mixing fertilizers, transporting them and applying them to the soil.

Rational use of the increased flow to the countryside of agents for the chemization of agriculture will undoubtedly ensure further increase in field productivity, the production of the products of agriculture and live-stock raising and more complete satisfaction of our country's requirements for them.
[67-9380]

9380
CSO: 1841

USSR UDC 661.634.2+631.893

STUDY OF THE PRODUCTION OF PHOSPHORIC ACID AND COMPLEX FERTILIZERS FROM PHOSPHORITES OF THE ASERI DEPOSITS

Tallin IZVESTIYA AKADEMII NAUK ESTONSKOY SSR - KHIMIYA in Russian Vol 28 No 3, 1979 pp 204-209 manuscript received 10 Nov 78

AASAMAE, E., VEIDERMA, M., REBANE, Anne

[Abstract] Results are presented from studies of the process of sulfuric-acid abstraction of phosphoric acid from Aseri phosphorites and processing of the extracts produced into ammophos and nitroammophos. A cyclical method was used to imitate the continuous process of production of extracts, with triple washing of phosphogypsum. Extraction was usually performed at 75 C, although 90 C was also used in two experiments. The results showed that the best specimens of Aseri concentrates can used to produce ammophos and nitroammophos, the results depending on the content of magnesium and iron in the raw material. Since the iron concentration is basically uniform, the acceptance criterion for raw material can be formulated as $MgO:P_2O_5 \leq 10\text{-}13:100$. Figure 1, References 4 Russian. [60-6508]

USSR UDC 631.84:633.11:(470.45)

THE EFFECT OF NITROGEN FERTILIZERS ON THE YIELD AND QUALITY OF WINTER WHEAT IN THE SOUTHERN CHERNOZEM ZONE OF VOLGOGRADSKAYA OBLAST

Moscow AGROKHIMIYA in Russian No 8, Aug 79 pp 3-8 manuscript received 6 Jun 78

KHIL'KO, V. T., KHIL'KO, L. F. and RUBAN, M..D., Volga Area Experimental Plant Breeding Station of the All-Union Scientific Research Institute of Corn, Volgogradskaya Oblast

[Abstract] The effect of periods, methods of application and forms of nitrogen fertilizers on the yield and quality of winter wheat was studied during 1974-1976 at the Volga Area Plant Breeding Experimental Station of the All-Union Scientific Research Institute of Corn, located in Uryupinskiy Rayon of Volgogradskaya Oblast under unirrigated conditions. The field experiments were set up on plots of the Agrotechnics and Seed Growing Laboratory of Grain Crops in a six-fold crop rotation of bare fallow, winter wheat and corn for spring wheat, peas and barley. The frequency was threefold, the calculated area of the plots was 100 m^2 and the variety was Mironovskaya yubileynaya 50. The cultivation techniques of the winter wheat were those generally used for the zone. Fall

plowing to a depth of 25-27 cm was carried out after harvesting the barley. The soil was then left bare fallow. Mineral fertilizers at the rate of 3 qt/ha of P_{sg} (P60) and 2.5 qt/ha of N_{aa} (N85) were applied as a general background as preplanting cultivation. The wheat was sown during the optimum period of 28 to 31 August. The soil of the experimental plot was low-humus average loamy Chernozem with humus level of 32-45 cm, clod layer depth of 10-16 cm, depth of tilling in the carbonates of 50-60 cm and an underlying layer of carbonaceous loam with soil-forming rock of light gray sandy loam changing to sand. The soil of the clod layer had various agrochemical indicators of humus, total nitrogen, easily hydrolyzed nitrogen, nitrate nitrogen and various phosphorous and potassium compositions. The soil was regarded as being well supplied with potassium and available phosphorus and medium supplied with nitrogen. The nitrogen availability was a function of moisture provision to the soil. Nitrogen top dressings were studied on a background of N85P60. Ammonium nitrate and urea were applied superficially early in the spring on raw soil at the rates of 2.7 qt/ha and 1 qt/ha, respectively. The roots of the winter wheat were top dressed with a 30 percent urea solution (1 qt/ha per 233 liters of water) during the heading phase. The grain was harvested by direct combining. The experimental results were processed mathematically by using Dospekhov's dispersion analysis. The total nitrogen content in the winter wheat was determined according to Kjeldahl, protein content was determined by recalculation to coefficient 5.7, gluten content was determined by the washing method, the strength of the flour was determined on an alveograph and the volume of the bread was determined from 100 grams of flour. The temperature conditions during the experiments were close to normal in 1974, slightly above normal in 1975 and slightly below normal in 1976; 1976 had the best weather conditions for growth and development of the winter wheat and grain formation with precipitation of 485 mm, of which 59 percent of the total amount fell during the period from April through August. The experiments showed that additional application of nitrogen fertilizers by early spring or non-root top dressing had no positive effect on the winter wheat yield, the grain unit and the weight of 1,000 grains. Nitrogen top dressings do increase the protein content and vitreousness of the grain and also the raw gluten content. Application of nitrogen in early spring and during the ear formation phase ensures a higher increase of gluten. Application of urea during spring top dressing one time with fertilizer application before planting is also effective in improving the quality of the grain. One-time application of urea in the spring after application of a nitrogen-phosphorus fertilizer prior to sowing also provides the highest net income from the grain. References 21: 20 Russian, 1 Ukrainian.
[47-6521]

USSR

THE EFFECT OF SYSTEMATIC APPLICATION OF FERTILIZERS ON THE AGROCHEMICAL INDICATORS OF THE FERTILITY OF LEACHED CHERNOZEM AND THE YIELD OF CORN WITH PERMANENT CULTIVATION OF IT

Moscow AGROKHIMIYA in Russian No 8, Aug 79 pp 39-45 manuscript received 18 Apr 78

GETMANETS, A. YA., KUZ'MINA, A. P., STULIN, A. F., YES'KOV, V. A. and SAVVINA, M. S., All-Union Scientific Research Institute of Corn, Dnepropetrovsk, and the Voronezh Experiment Station of the Scientific Research Institute of Corn

[Abstract] The effect of the types and doses of mineral fertilizers during systematic application of them on the dynamics of the main nutrients in the soil, feeding and productivity of plants and the extent of the loss of the main nutrient elements by the yield of corn during permanent cultivation was studied in a prolonged field experiment at the Voronezh Experiment Station of the Scientific Research Institute of Corn. The corn was cultivated permanently from 1961 with a break of permanence in 1969-1970. Fertilizers were applied to the plowed ground in the fall of 1966 in the form of N_{aa}, P_{sg}, and K_{kh}. The planted area was 269.5 m^2 and the area taken into account was 192.5 m^2 with three-time repetition. Corn hybrid VIR 25 was planted prior to 1969 and Dneprovskiy 247 MV was planted since 1971. The agricultural practices of corn cultivation for silage were the same as generally adopted in the central Chernozem zone of the RSFSR. The soil of the experimental plot was leached chernozem containing 5.7 and 5.0 percent, respectively, humus in the plowed and subsoil layers. The total nitrogen content was 0.28 and 0.25 percent, phosphorus content was 0.18 and 0.15 percent, potassium content was 1.88 and 2.09 percent, easily hydrolyzed nitrogen was 59 and 49 milligrams, available potassium was 120 and 100 milligrams, exchangeable potassium was 219 and 200 mg/kg of soil and the pH was 5.6 and 5.7. Soil sampling was taken from the plowed layer at five locations of the plot during the three repetitions of the experiment over five periods. The nitrate nitrogen, available phosphates and exchangeable potassium were determined. Plant samples were selected and prepared for chemical analysis by the generally accepted method. The nitrogen, phosphorus and potassium content were determined in the plant specimens by the Kjeldahl, photocolorimetrically and on a flame photometer, respectively. The yield data were processed mathematically by the dispersion analysis method. Precipitation during the experiment varied from 89.6 mm in 1972 to 309.0 mm in 1976 with an average of 231.3 mm over the period of the experiment. The agrochemical properties of the leached chernozem showed a positive increase of practically all soil fertility indicators with systematic nitrogen application. Mineral fertilizers also increased the exchangeable potassium content in the soil by an average of 13-26 percent compared to the control, although

the exchangeable potassium content did decrease toward the blooming-milky wax ripeness stage of the grain. Nutrient substances in the corn and the accumulation of dry matter were both increased as a result of mineral fertilizer application. The application of nitrogen fertilizer caused the greatest increase, while posassium caused a lower increase and phosphorus even lower. Fertilizer application at the rate of 120 kg/ha has the best effect on the nitrogen and potassium balance, while phosphorus application at the rate of 30 kg/ha significantly enriches the soil with this element. The optimum dosage of mineral fertilizers is N60-90P30K60 when growing corn on leached chernozems on a permanent basis. References 17: 16 Russian, 1 Ukrainian.
[47-6521]

USSR UDC 632.954

THE MAIN KINETIC CHARACTERISTICS OF THE TOTAL PROCESS OF PIKLORAM DECOMPOSITION IN THE SOIL

Moscow AGROKHIMIYA in Russian No 8, Aug 79 pp 112-116 manuscript received 21 Aug 78

SPIRIDONOV, YU. YA., MAKEYEVA-GUR'YANOVA, L. T., SHESTAKOV, V. G., SHABAONV, A. K., and BONDAREV, V. S., All-Union Scientific Research Institute of Phytopathology, Moskovskaya Oblast

[Abstract] The main kinetic principles of the total decomposition of pikloram in the soil was studied and the rate constants and activation energy of the process were determined to analyze the possible methods of pikloram decomposition in the soil. Previous experimental data on degradation of the herbicide in soddy-podzolic soil with permanent moisture content of 60 percent of the total moisture capacity and at temperatures of 5, 22 and 35°C were used to calculate the main kinetic characteristics of the total decomposition process. Linear regression equations were used to calculate the degradation process of pikloram in the soil and the activation energy and rate constants. The total activation energy of the observed total decomposition process of pikloram in the soil under the approximated natural field conditions was expressed with a low value of 5.5 kcal/g per mole. This low value can be explained by the clearly marked catalytic process of pikloram breakdown in the soil due to the activity of biological catalysts of microbial origin. Figures 3.
[47-6521]

USSR UDC 631.89

PRODUCTION OF CHLORINE-FREE AND SULFUR-FREE N-P-K FERTILIZERS IN THE NITRIC ACID TREATMENT OF AN APATITE CONCENTRATE

Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 5, 1979 pp 3-4 manuscript received 16 Nov 77

GOLUB, A. M., MULYARCHUK, I. F., FILIPPOVA, F. I. and GORDIYENKO, V. M., Kiev State University

[Abstract] A description is given of a method for the thorough nitric acid treatment of an apatite concentrate, whereby chlorine-free and sulfur-free N-P-K fertilizers are produced, by utilizing potassium sulfate or potassium carbonate. The potassium sulfate is used simultaneously to extract gypsum. With a potassium sulfate ratio of about 97 percent of the calcium is precipitated in the form of gypsum, a process which takes three or four hours at 60°C, resulting in crystals measuring 200 to 400 μ, without the formation of disulfates along with the calcium. The gypsum extracted is close to a chemically pure substance. By this method for the first time homogeneous melts of an N-P-K mixture are produced directly in the evaporator. Anhydrous, homogeneous mobile melts are produced at 186°C in the evaporator without solid precipitates. A mixture of NH_4NO_3, KNO_3, $NH_2H_2PO_4$ and H_2O is obtained after extraction of the gypsum and neutralization of the extract. By introducing a step-by-step evaporation process it is possible to bypass the crystallization region in the 120° to 165°C range and thus avoid the precipitation of solids. Another advantage of the method is that it incorporates the process of monodisperse granulation of the melt in a tower, a process developed at the Ukrainian SSR Academy of Sciences Institute of Technical Thermophysics. By this process granules of a strictly definite size are produced. The granules produced are distinguished by good physical properties, do not cake and are threefold better than existing nitrophosphate fertilizers in terms of strength, and 2.5-fold in terms of stability in water. With a ratio of N:P:K = 1:0.7:1 the total content of nutrients in the fertilizer is 53.5 percent. When potash is used the additional advantage is gained of producing calcium carbonate as chemically precipitated chalk, which is a scarce product and is used as a filler in plastic, rubber, paper and paint and varnish products. The potassium sulfate produced in the conversion process is recycled for the purpose of precipitating gypsum, so that sulfate ions are recycled in extracting the calcium in the form of gypsum and the problem of sulfur, sulfuric acid and sulfates is solved. In addition, the process has demonstrated the vast potential of an apatite concentrate as a raw material for producing strontium, fluorine and rare earth elements. This method is better in many respects than existing foreign methods of treating phosphates with nitric acid. Figures 1; references 8: 7 Russian, 1 Western.
[41-11,176]

USSR UDC 547.26'118

ACIDIC PROPERTIES AND REACTIVITY OF CYCLIC THIOPHOSPHOROUS ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1693-1697 manuscript received 10 May 78

OVCHINNIKOV, V. V., GALKIN, V. I., CHERKASOV, R. A. and PUDOVIK, A. N., Kazan State University imeni V. I. Ul'yanov-Lenin

[Abstract] The authors have been investigating the chemistry of cyclic acid phosphites--structure, ionization constant, tautomerism and reactivity--and have extended these studies to sulfur analogs of those compounds. Specifically, the present study is to define the influence of substitution of an oxygen atom in the phosphoryl group by a sulfur atom. Ovchinnikov et al., (1978) had shown the formation of i) a tautomeric structure or ii) a protonized phosphite form, as characteristic of phospholane derivatives of cyclophosphorous acids. It is now shown that reaction of thionecyclophosphites with elementary sulfur can produce 0,0-alkylenedithiophosphoric acids. Ionization constants of the latter, and their capacity to react with sulfur support the displacement of the phosphonate-phosphite to the acid form. Tautomers of 2,3-butylenethiophosphonic acid derivatives--which vary with respect to acidity--can be present in aqueous alcohol solution, apparently due to the acceptor capacity of a dioxaphospholane substitution on the phosphorus atom. Identification of structures synthesized has been made by IR and NMR spectroscopy. Figures 1; references 10: 8 Russian, 2 Western (one is a US patent). [26-8586]

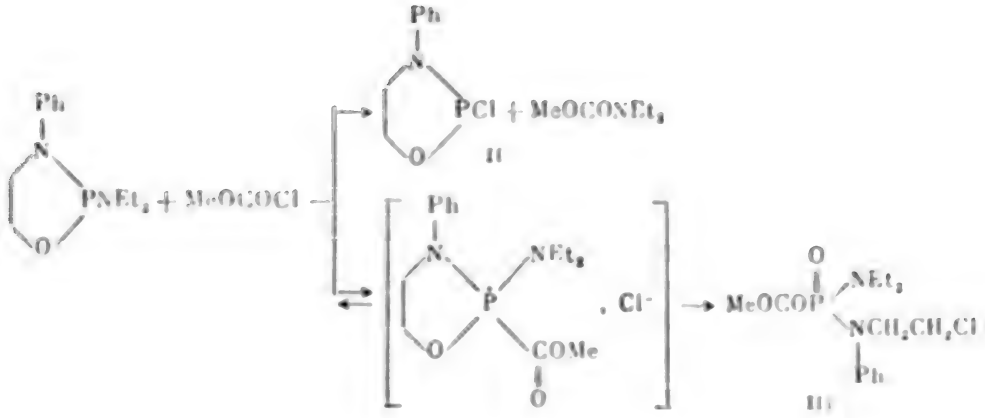
USSR UDC 547.794.2.118

REACTION OF 2-DIETHYLAMINO-3-PHENYL-1,3,2-OXAZAPHOSPHOLANE WITH ACYL HALIDES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1698-1705 manuscript received 31 Oct 78

PUDOVIK, M. A., KIBARDINA, L. K., BATYYEVA, E. S. and PUDOVIK, A. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbusov, Kazan Filial, USSR Academy of Sciences

[Abstract] 2-Diethylamino-3-phenyl-1,3,2-oxazaphospholane was reacted with several acyl halides of carboxylic acids (CH_3COCl; C_6H_5COCl; CH_3OCOCl; CH_3COBr and C_6H_5COBr). The reaction with CH_3OCOCl is shown to occur as follows:



Actual features of the reaction have been found to be governed by the acyl halide used, the solvent (presence of, nature, or absence of), acidic additives and temperature of reaction. Acid catalysis takes place with initial protonization by the free halogen hydride admixed with the acyl halide. It is also seen that the bromine atom of 2-Br-1,3,2-dioxa- and oxazaphospholanes can be replaced by a chlorine atom when those compounds are reacted with triethylamine hydrochloride. References 13: 9 Russian, 4 Western.
[26-8586]

USSR UDC 547.26'118

REACTION OF AMIDES AND ESTERS OF TRIVALENT PHOSPHORUS ACIDS WITH NITRILES OF AMINOKETOCARBOXYLIC ACIDS

Leningrad ZHURAAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1705-1712 manuscript received 14 Apr 78

KONOVALOVA, I. V., YUDINA, R. V., MIKHAYLOV, YU. B., OFITSEROVA, E. KH and PUDOVIK, A. N., Kazan State University imeni V. I. Ul'yanov-Lenin

[Abstract] This article reports results of study of the reaction of 0,0-dimethyl-N,N-dimethylamidophosphite with nitrites of benzoylformic (I), pyruvic (II) and trimethylpyruvic (III) acids. Reaction with I yields a 5-coordinated phosphorus atom; with II, 0-methyl-N,N-dimethyl (alpha-cyanoethyl) phosphate; with II, an oxidation product plus 1,2-di-tert-butyl-1,2-dicyanoethylene. Amides and esters of 3-coordinated phosphorus acids play the role of catalysts in the trimerization of III to yield 2,4,6-trispivaloyl-1,3,5-triazine. Triethylphosphite and III react to form a trimerization product and diethyl (alpha-cyano-beta, beta-dimethyl-vinyl)phosphate. Reactions cited are illustrated by equations. References 22: 13 Russian, 9 Western.
[26-8586]

USSR UDC 547.241

MONOXIDES OF DIAMIDODIALKYLDIPHOSPHINES AND THEIR ISOMERIC ANHYDRIDES. REARRANGEMENT IN A SERIES OF THESE COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1712-1724 manuscript received 10 Jul 78

FOSS, V. L., LUKASHEV, N. V., VEYTS, YU. A. and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] The authors' laboratory had earlier shown (1973, 1977) that monoxide unsymmetrical alkylalkoxydiphosphines occur as three isomers, the most stable of which is the compound $R_2P\text{-}P(O)(OR')_2$. If the great thermodynamic stability of that isomer is due to the mesomeric donor capacity of the alkoxygroups, analogously structured isomers with dialkylamino groups will rearrange in the same direction: $R_2P(O)\text{-}P(NR'_2)_2$, compound I, to $R_2P\text{-}O\text{-}P(NR'_2)_2$, compound II, to $R_2P\text{-}P(O)(NR'_2)_2$, compound III. Compounds I, II and III were synthesized to test this hypothesis. Synthesis is described for various I, II and III compounds with different R and R' residues, and their chemical and physical properties are listed. Compounds of I were found to be more stable than the alkoxy analogs even though rearrangement of the two types was the same. Reaction conditions are discussed. References 9: 6 Russian, 3 Western (two by Foss, et al.). [26-8586]

USSR UDC 547.241

MONOXIDES OF STERICALLY-HINDERED SYMMETRICAL TETRAALKYLDIPHOSPHINES. PHOSPHOROTROPIC EQUILIBRIUM

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1724-1729 manuscript received 17 Jul 78

FOSS, V. L., SOLODENKO, V. A., VEYTS, YU. A. and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] Foss, et al., showed earlier (1976) that in phosphinic acid anhydrides, the increase in volume size of the radicals attached to the phosphorus atom is one of the reasons for their increased relative stability, as compared with isomeric monoxides. This article reports synthesis of a series of monoxides of tetraalkyldiphosphines with the general formula I (wherein the oxygen is attached to one phosphorus atom by a double bond) to study their ability to isomerize into anhydrides, formula II, (wherein the oxygen atom joins the two phosphorus atoms, P-O-P. The series prepared with formulas I and II had R as tertiary-butyl, isopropyl, isobutyl, butyl and phenyl. The spectrally-determined field of existence of stable

anhydrides of the dialkylphosphinic acids was limited to those compounds in which two tertiary or one tertiary plus one secondary radical were bound to the phosphorus. The thermodynamic functions of isomerization of the monoxides into the anhydrides were studied to elucidate the nature of the steric hindrance. References 13: 6 Russian, 7 Western (two by Foss, et al.).
[26-8586]

USSR UDC 547.241+547.245

REACTION OF HEXAMETHYLDISYLTIAN WITH HALIDE ANHYDRIDES OF PHOSPHORUS ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1730-1731 manuscript received 21 Jul 78

LEBEDEV, YE. P., MIZHIRITSKIY, M. D., BABURINA, V. A. and OFITSEROV, YE. N., Kazan Filial, All-Union Scientific Research Institute of Synthetic Caoutchouc imeni S. V. Lebedev

[Abstract] Note is made of the lack of literature references to the title reaction type. This article reports a study of the reaction of hexamethyldisyltian with oxychlorides of acids of P^{III} and P^{V} with the structure of $(RO)_2PCl$, where R=Me, Et, NMe_2; and the structure of $(RO)_2P(O)Cl$, where R=Me, Et, Pr or Bu. The oxychlorides of P^{V} acids reacted like the oxyhalides of carboxylic acids. Trimethylhalogenoxylanes and trimethylsilyldialkylthionephosphates were formed (when the ratio of the starting reagents was 1:1); non-symmetrical tetraalkylmonothiopyrophosphates were formed (when the ratio was 1:2). The oxychlorides of P^{III} acids formed tetraalkylmonothiopyrophosphites. References 7 (Western).
[26-8586]

USSR UDC 547.26'118+547.245

REACTION OF HEXAMETHYLDISYLTIAN WITH DIALKYL ESTERS OF ALPHA-HYDROXYALKYL (BENZYL)PHOSPHONIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1731-1737 manuscript received 3 Jul 78

LEBEDEV, YE. P., MIZHIRITSKIY, M. D., BABURINA, V. A., MIRONOV, V. F. and OFITSEROV, YE. N., Kazan Filial, All-Union Scientific Research Institute of Synthetic Caoutchouc imeni S. V. Lebedov

[Abstract] This is an extention of ongoing studies of the reaction of alcoholysis of organosyltians (authors' laboratory, 1976, 1977). In the present article work is reported on the reaction of hexamethyldisyltian (I)

with several dialkyl esters of the title acids II with the general structure $(R^1O)_2P(O)CR^2R^3(OH)$ where R^1 is Me, Et; R^2 is H, Me; R^3 is Me, Et, Ph. I reacted with II to give a high yield of 0,0-dialkyl-alpha-trimethylsiloxyalkyl(benzyl)phosphonate, III. The reaction rate appeared to be a function of the acidity of the proton of the hydroxyl group. Course patterns of this reaction type resembled the patterns of reactions of organosyltians with proton-donor reagents. III phosphonates readily react with proton-donor reagents and acid oxyhalides with rupture of the Si-O bond. Figure 1; references 12: 11 Russian, 1 Czech. [26-8586]

USSR UDC 541.6:547.1.118

PHOTOELECTRONIC SPECTRUM AND ELECTRONIC STRUCTURE OF VINYLDICHLOROPHOSPHONATE $Cl_2P(O)CH=CH_2$

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1737-1745 manuscript received 17 Jul 78

ZVEREV, V. V., VILLEM, YA. YA., ISLAMOV, R. G. and KITAYEV, YU. P., Institute of Organic and Physical Chemistry imeni A. Ye. Arbusov, Kazan Filial, Academy of Sciences; Tartu State University

[Abstract] The title compound (I) exhibits properties of two classes of compounds, as a coordinated P atom compound and as a representative of the $XCH=CH_2$ substituted ethylenes. The present article is a detailed report of an extension of photoelectronic studies (PES) on a series of 4-coordinated P compounds (Zverev, et al., 1975 to 1978). The PES and quantum chemistry were used to examine the structure of I. The ionization potentials of high occupied orbitals of functional groups were studied for $Cl_2P(O)X$; HX; and $(EtO)_2P(O)X$; the $Cl_2P(O)$ group stabilizes the frontal orbitals of the double bond at leV; the activities of the $(EtO)_2P(O)$ and H groups are approximately equal. References 28: 20 Russian, 8 Western. [26-8586]

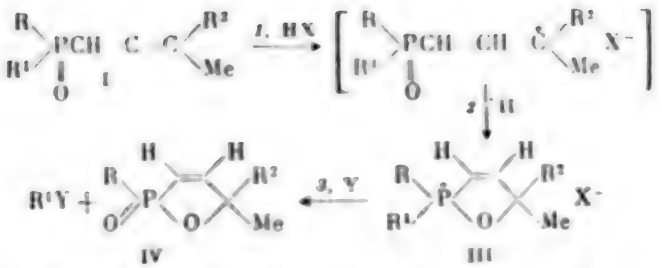
USSR UDC 547.341

CYCLIZATION OF ORGANOPHOSPHORUS ALLENES IN ACID MEDIA

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1752-1756 manuscript received 16 Nov 78

MIKHAYLOVA, T. S., CHUNIN, YE. D., SKVORTSOV, N. K., IGNAT'YEV, V. M. and IONIN, B. I., Leningrad Technological Institute imeni Lensovet

[Abstract] The title cyclization is pictured as follows (based on available data:



Ia, R = R' = R'' = Me; Ib, R = Ph, R' = OMe, R'' = Me; Ic, R = R' = OMe, R'' = Me; Id, R = R' = OPr-i, R'' = Me; Ie, R = R' = OMe, R'' = Et; X = Cl^-, HSO_4^-, CF_3COO^-; Y = Cl^-, HSO_4^-, CF_3COO^-, OH^-, H_2O.

Based on kinetic measurements, the mechanism in acid media involves a slow transfer of a proton to the central carbon atom of the allene system followed by a rapid attack of the carboxyl ion by the internal nucleophil-oxygen of the phosphoryl group and by formation of a cyclic quasiphosphone salt. The dependence of the rate of reaction on the acidity function of the media and on the parameters of activation indicate the substantial orderliness of the transfer condition of the reaction. Protonization of the phosphoryl group causes a slowdown in the reaction rate as a consequence of destabilization of the carboxylic ion. The quasiphosphone salts are stable in media with low nucleophilic character but are rapidly converted into hydroxyphospholenes under the action of active nucleophilic agents. Figures 2; references 9: 5 Russian, 4 Western.
[26-8586]

USSR UDC 541.57:546.18:546.17:542.938

INTRAMOLECULAR INFLUENCE OF THE CARBOXYL GROUP ON THE DIRECTION OF HYDROLYSIS OF AMIDOPHOSPHITES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1756-1763 manuscript received 11 Sep 78

MUKHAMETOV, F. S., STEPASHKINA, L. V. and RIZPOLOZHENSKIY, N. I., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Filial, USSR Academy of Sciences

[Abstract] This is a continuation of earlier research on the unique chemical behavior of amidophosphites which contain, as an ester radical, a beta-keto alcohol of $(R_2N)(X)POC(R')(R'')CH_2C(O)CH_3$--compounds I. The present work is a study of the reaction of I with water, where acids (II) were expected which have a gamma-ketoalkyl radical. The authors suggested II as intermediates in the synthesis of 2-substituted hydroxyphospholane-3-oles (compounds III) from dichloroanhydrides of PIII acids and beta-ketoalcohols in the presence of bases, but could not isolate them. The reaction of I with water can be viewed as a model experiment in the synthesis of the intermediate products, II. Reactions of I with

water do not produce open-chain phosphorus acids with a gamma-ketoalkyl radical, but their cyclic isomer, voz., 2-substituted 2-hydroxy-1,2-hydroxyphospholan-3-oles. With dialkylamidoalkyl-alpha, alpha-dimethyl-gamma-keto-butylphosphites, the P-N bond is maintained. The behavior in the hydrolysis is attributed to an intramolecular reaction of the gamma-ketogroup with the phosphorus atom; this leads to a quasi-phosphone product and--due to change in direction from the reaction of replacement of the aminogroup--to the Arbuzov rearrangement reaction. References 8 (Russian; one multiple Russian reference cites a Western reference, Boisdon, et al., 1977).
[26-8586]

USSR UDC 547.26'118

PENTA(alpha, alpha, omega-TRIHYDROPOLYFLUOROALKOXY)PHOSPHORANES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1764-1768 manuscript received 6 Dec 78

MARKOVSKIY, L. N., KOLESNIK, N. P. and SHERMOLOVICH, YU. G., Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] Emphasis in this area of study has been the stability of products produced, with the help of insertion of electro-acceptor substituents into, e.g., acyclic phosphoranes. When tris (alpha, alpha, omega-trihydropolyfluoroalkyl)phosphites react with chlorine and bromine, dihalidephosphoranes (I) are formed which are stable at -40°C. When I react with aniline and alpha, alpha, omega-trihydropolyfluoroalkanoles there are formed phosphazobenzenes and the title compounds. The latter are stable to the action of organic acids and are unchanged when heated to 180°C, a property attributed to the polyfluoroalkoxyl groups. References 11: 3 Russian, 8 Western (one US patent).
[26-8586]

USSR UDC 547.26.118+547.476.1+547.281

REACTION OF AMIDOPHOSPHITES WITH MALONYL ESTER AND PARAFORM

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1768-1772 manuscript received 25 Sep 78

IVANOV, B. YE., KUDRYAVTSEV, L. A., SAMURIN, S. V., AGEYEVA, A. B. and KARPOVA, T. I., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Filial, USSR Academy of Sciences

[Abstract] Condensation in a three-membered system, viz., malonyl ester-aldehyde-trialkylphosphites had been shown to produce esters of substituted

2,2-dicarboethoxyethylphosphonic acids (Ivanov, et al., 1969). This type of reaction has occupied the authors' attention; study was then made of the condensation in the system: malonyl ester--paraform-aminophosphites; in this reaction the malonyl ester was treated with amidophosphites which had OEt or NEt_2 substituents on the phosphorus atom (reaction 1). Condensation in the three membered system (malonyl ester-paraform-diethylamidodiethyl phosphite) formed the diethyl ester of 2,2-dicarboethoxyethylphosphonic acid (DCEEP) and a small amount of the divinyl ester of 2-2-carboethoxy-2-[carbo(N,N-diethylamido)] ethylphosphonic acid. DCEEP is produced from the reaction of the malonyl ester and paraform with triethylphosphite (formed in reaction 1) or with diethylamidoethylphosphite reaction in the three membered system. Additional products of these reactions are tabulated. Identity of products was assisted with IR and NMR spectroscopy. References 12: 11 Russian, 1 Western.
[26-8586]

USSR UDC 547.341

ADDITION TO VINYLTHIOPHOSPHONATES OF ALCOHOLS, AMINES, DIALKYL(THIO)PHOSPHITES, HYDROSTANNANES AND STANNYLPHOSPHITES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8, Aug 79 pp 1772-1777 manuscript received 18 Apr 78

BARGOV, F. V. and GALKINA, N. YE., Chuvash State University imeni I. N. Ul'yanov

[Abstract] Although detailed studies have been made of the addition reaction of nucleophilic reagents, containing a labile hydrogen atom, to alkenylphosphonates, reaction of nucleophilic reagents with alkenylthiophosphonates has not been studied. The present article described study of the reaction of alcohols (I), secondary amines (II), dimethylphosphite (III), dialkylthiophosphites (IV) and hydrostannanes (V) with esters of vinylthiophosphonic acid (VI). In this type of reaction compounds I, II and IV add to VI as a phosphonethylation; III compounds do not add, either in the presence of alcoholates or peroxides. The addition of V to VI can proceed to yield a beta isomer or alpha addition. The hydrostannylation is exothermic; ratio of products (identified by IR spectra) formed is a function of the size of the alkoxyl radical of VI. Figure 1; references 14 (Russian).
[26-8586]

USSR UDC 547.88

AMINOLYSIS OF 2,2,4-TRICHLORO-1,3,5-TRIAZA-2-PHOSPHORINES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8 Aug 79 pp 1777-1782 manuscript received 29 Aug 78

KORNUTA, P. P., KOLOTILO, N. V. and KALININ, V. N., Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] Kornuta, et al., have shown earlier (1977, '78) that PCl_5 reacts with carboxylic acid N-cyanamidines to form 2,2,4-trichloro-1,3,5-triaza-2-phosphorines (II). In the present study, II was reacted with various amines. It was found that the chlorine atoms can be replaced by an aminogroup. The degree of replacement is a function of the ratio of reagents and the nature of the amine. Mono, di- and triamino-derivatives are formed; the derivatives synthesized are listed, with their PMR spectra data. References 3: 2 Russian, 1 Western. [26-8586]

USSR UDC 547.241

PHOSPHAZO-BETAINE TAUTOMERS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8 Aug 79 pp 1782-1787 manuscript received 14 Aug 78

GUSAR', N. I., CHAUS, M. P. and GOLOLOBOV, YU. G., Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] After having demonstrated (Gusar', et al., 1978) that trivalent phosphorus compounds react with azidocarboxylic acids to form betaine--due to transfer of a proton of the COOH group, in the intermediary phosphazo compound, from the oxygen to the amino nitrogen--the author synthesized and studied similar betaines with an anion center on the N atom, analogous to amino acids, and with a potential biological action. The synthesis involved a prototropic shift. Starting materials for synthesis of such compounds included previously unknown N-(2-azidoethyl) amides of carboxylic and diethylphosphoric acids, which were prepared by reacting the corresponding N-(2-chloroethyl) amides with sodium azids in the presence of dimethylformamide. Staudinger reaction products were prepared with hexamethyltriamidophosphite; these compounds had a phosphazo structure, except for the trifluoroacetyl derivative which can exist both in a phosphazoform and in a betaine form, or in an equilibrium mixture of both forms. Figure 1; references 4: 2 Russian, 2 Western. [26-8586]

USSR UDC 547.794+547.794.3

REACTION OF METHYL ESTERS OF 3-ACETYL- AND 3-PHENYLDITHIOCARBAZINIC ACIDS WITH PHOSPHOROUS OXYCHLORIDE, PHOSPHOROUS TRICHLORIDE AND THIOTRICHLORIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8 Aug 79 pp 1896-1901 manuscript received 24 Jul 78

SHVETSOV-SHILOVSKIY, N. I., NESTERENKO, D. P. and STEPANOVA, A. A., All-Union Scientific Research Institute of Chemical Plant-Protective Agents

[Abstract] The reaction of methyl esters of 3-acetyl and 3-phenyldithiocarbazine acids with PCl_3 produces 2-acetyl- or 2-phenyl-1-chloro-4-methylthio-1,2-dihydro-1,5,2,3-phosphathiadiazoles. The chlorine atom of the products--under the action of amines and alcohols in the presence of an HCl acceptor--is replaced by an OR" and NRR' group. Reactions of the methyl ester of 3-phenylthiocarbazinic acid with $POCl_3$ and $PSCl_3$ yield phosphathiadiazoles; the methyl ester of the 3-acetyl analog reacts with $POCl_3$ and $PSCl_3$ to yield 2-CH_3-5-methylthio-1,3,4-thiadiazole HCl. References 7: 1 Russian, 6 Western (one English and one French patent). [26-8586]

USSR UDC 547.241.07(088.8)

PATHWAYS OF CONVERSION OF ALKYLPHOSPHONOUS ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8 Aug 79 pp 1905-1906 manuscript received 24 Jan 79

NIFANTYEV, E. YE., SHCHEPET'YEVA, N. P. and MAGDEYEVA, R. K., Moscow State Pedagogy Institute imeni V. I. Lenin

[Abstract] Interest in the title compounds was precipitated by relative absence of reports on them. The authors' laboratory worked out (1978) synthesis of the compounds and undertook study of their properties. Hydrogen peroxide oxidation was found to yield a good return of alkylphosphonic acids, $RP(O)H(OH) + H_2O_2$ yielding $RP(O)(OH)_2$. Chemical properties of the products (for various Rs, e.g., C_6H_{13}) are listed. Basic interest of the derivatives lies in their capacity to attach to sulfur to form thiophosphonic acids, RPO_2SH_2. [26-8586]

USSR UDC 547.241+547.841

TRIETHYLPHOSPHITE REACTION WITH 2-CHLORO-3-ACETOXY-1,4-DIOXANE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8 Aug 79 pp 1906-1907 manuscript received 2 Feb 79

TSIVUNIN, V. S., ZARIPOVA, V. G., ZYKOVA, T. V. and SALAKHUTDINOV, R. A., Kazan Chemical Engineering Institute imeni S. M. Kirov

[Abstract] Reference is made to earlier found (1979) reactions of 2-Cl-3-acetoxy-1, 4-dioxane (II). The present report outlines the reaction of II with triethylphosphite (I), a reaction which can proceed in two directions. The basic products (direction a) are diethylphosphorous acid (III) and (direction b) 2-CH_3-2 diethylphosphonyl-1,3,4,7-tetraoxahydride (IV). Chemistry of the reactions indicate that the reaction center of II is the carboxyl carbon, but the difference in the nucleopnilic nature of the diethylphosphite anion and the triethylphosphite causes formation of the different end products. References 2 (Russian).
[26-8586]

USSR UDC 547.26'118.241.624

TETRAALKOXYDIPHOSPHINES. STEREOCHEMISTRY OF THE ADDITION OF TETRAALKOXYDIPHOSPHINES TO ALKOXYACETYLENES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8 Aug 79 pp 1910-1911 manuscript received 23 Feb 79

PROSKURINA, M. V., KARLSTEDT, N. B. and LIVANTSOV, M. V., Moscow State University imeni M. V. Lomonosov

[Abstract] The authors have been intensively investigating the tetraalkoxydiphosphines (1973-1978). The title addition--which occurs readily at 0-10°--is illustrated, using, as an example, tetrabutoxyphosphine adding on alkoxy (or butoxy) acetylene. NMR spectra show the presence of 3-coordinated atoms of phosphorus in the attachment products. The addition, with respect to the triple bond of the alkoxyacetylenes, proceeds stereoselectively as a cis-addition; a radical mechanism for this conversion is apparently excluded by data indicating a molecular mechanism. References 3 (Russian).
[26-8586]

USSR UDC 547.341

ALLENE-DIENE ISOMERIZATION DURING ELECTROPHILIC REPLACEMENT OF THE ALKOXY GROUP IN 1-ALKOXY-3, 4-BUTADIENE-2-DIALKYLPHOSPHONATES

Leningrad zHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8 Aug 79 pp 1911-1912 manuscript received 26 Feb 79

BREL', V. K., SKVORTSOV, N. K., DOGADINA, A. V., IONIN, B. I. and PETROV, A. A., Leningrad Technological Institute imeni Lensovet

[Abstract] Brel', et al., had already established (1979) that nucleophilic replacement of the halogen in 1-chloro-2,3- butadiene-2-dialkylphosphonates (I) by an alkoxy group proceeds without isomerization, leading to esters of 1-alkoxy-2, 3-butadiene-2-phosphonic acids. In contrast, substitution of a methoxy group in I with a halogen is accompanied by an allene-diene isomerization with formation of esters of 3-halogen-1, 3-butadiene-2-phosphonic acids (II). The difference is attributed to the presence, simultaneously, in I on an electrophilic center of the digonal allene carbon and a nucleophilic center on the ether oxygen which promotes the course of a synchronic reaction with halogen hydrides. This reaction has been employed to synthesize 3-chloro-derivatives of phosphonoprenes and unstable 3-bromo-1, 3-butadiene-2-dialkylphosphonates. Reaction conditions are detailed. Reference 1 (Russian, viz., of Brel', et al.). [26-8586]

USSR UDC 547.242

REACTION OF NITROETHANE WITH SEVERAL TRIVALENT ARSENIC ACID DERIVATIVES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 49 No 8 Aug 79 pp 1916-1917 manuscript received 4 Dec 78

VALIULLINA, V. A., CHERNOKAL'SKIY, B. D. (deceased) and SHESTERNINA, T. A., Kazan Chemical Engineering Institute emeni S. M. Kirov

[Abstract] In the absence of reports on reactions of nitroalkanes with arsenous and arsenic acid compounds this Letter to the Editors relates a study of the reaction of nitroethane (NE) with ethylarsinoxide, bis (diethylarsine)oxide and the diethyl ester of ethylarsonium acid (III); under the conditions cited, the As-C bond is broken to yield arsenous oxide. The reaction of NE with III also yielded ethanol, ethyl acetate and nitroethane (11:2:1). The reaction products also contained other nitrogen and arsenic products not yet precisely defined. Identification of products used a Tesla B-487C NMR spectrometer. Reference 1 (Western). [26-8586]

DEVELOPMENT OF ULTRASTRONG POLYMERS

Moscow KRASNAYA ZVEZDA in Russian 16 Oct 79 p 2

[Article by Academician V. Korshak and Doctor of Chemical Sciences Ye. Krongauz: "The Achievements of Science and Technology: Polymers, The Materials of the Century"]

[Text] "The production of synthetic materials with properties prescribed in advance may be singled out among the trends of scientific and technical progress playing a special role in the 10th Five-Year Plan and determining the prospects of the long-range development of the economic system."

These lines from "Basic Trends in the Development of the USSR National Economy in 1976-1980", enacted by the 25th CPSU Congress, are an indication of the enormous importance of chemistry to the further development of engineering, industry and the entire national economy, in the struggle for careful expenditure of funds and natural resources and in the perfection of technology.

But what new materials have appeared during the 10th Five-Year Plan? What new methods of improving the properties of polymers are being prepared today by science and practice? Academician V. Korshak and Doctor of Chemical Sciences Ye. Krongauz answer these questions.

You will remember that at the dawn of our country's industrialization a poet wrote, "Steel! More steel! Twice as much copper! Twice as much iron!" The exclamations were supposed to stress with particular force the importance of, and need for, metal. Decades have passed. Today more than three billion tons of metal have been reified on this planet--in machines, arms, means of transport, etc. And although steel remains as before the "bread of industry", an increasingly stronger position is

being won by its serious rivals--polymeric materials. And it is not just a question of steel. On the average, each ton of plastic now replaces 5-6 tons of ferrous and nonferrous metals, 2-2.5 tons of aluminum and rubber, 3-3.5 tons of timber... The substitution of plastic parts for metal ones makes it possible to save 10-30 percent of the weight of a construction.

The unusual combination of strength and light weight makes polymers particularly attractive as diversified construction materials, which are so essential to the national economy. Thus, for example, the polymers used in manufacturing automobile tires surpass aulminum and construction steel approximately two-fold in strength. Plastic reinforced with fiber glass for increased strength--the so-called fiber glass re-inforced plastics--have a density four times lesser than that of steel but approach it in strength. They also have diamagnetism, good heat-, sound- and electrical insulating properties, high corrosion and chemical resistance to sea water, solvents and other aggressive agents; this enables them to compete successfully with alloyed and high-strength steels....

"Polymers" is not simply a popular term designating one of a group of 20th century materials. It is an enormous branch of science and technology the achievements of which are widely used in all fields of human activity. These wonder materials are indispensible today in aviation and electrical engineering, in automobile- and ship-building, in construction and medicine, in agriculture and the production of products for national consumption.

And what of defense technology? Magazines for rifles, shoulder straps, triggers, gunstocks, handles, barrel plates and cases which burn up together with warheads can be made from polymeric materials. Bullet-proof glass--a triplex consisting of several layers of organic glass bonded together with layers of clear plastic--has been well known for a comparatively long time...

In a word, there is direct evidence of the merits of the polymers already in existence, and their potentialities are great. And at the same time, what has been accomplished can be figuratively called only the above-water part of the "iceberg of the attainable." However surprising it may seem, today's polymeric materials are offering only 10-15 percent of their ideal, that is, theoretically achievable strength, hardness, and other important characteristics.

This is occurring because the internal structure of these materials is a disordered, chaotic system with the microimperfections inherent to different types of such structures. If the internal structure of a polymeric specimen were successfully "corrected" by arranging the atoms in an orderly construction such as, for example, that of precious stones, then its strength and other properties would approach the ideal.

This, however, is associated with enormous difficulties in changing the basic macromolecular structure of polymers, which develops during their synthesis and reprocessing. These problems must be overcome; science is engaged in doing this.

The first step on the path to creating stronger polymers is obtaining compound materials reinforced with filamentous crystals. The major difficulty here is achieving sufficient length in these crystals. The use of monocrystallic filaments (graphite filament, tungsten, molybdenum and boron crystals) has already made it possible to obtain compound materials with an ultimate strength of as much as 500 kg/mm^2 or more, instead of 100 kg/mm^2 for ordinary fiber glass-plastics.

More and more polymers are appearing which have higher than usual heat-resistance, photosensitivity, electric conductivity, electric insulation, semi-conductor or physiologically active properties, opening new possibilities for the progress of different fields of modern technology. For example, while traditionally plastics were used in electric technology as insulating materials, recently so-called "metal-containing polymers", which conduct an electric current well and have a number of advantages over metals, have appeared.

The use of polymers as antifriction materials in bearings and other units with dry friction, rolling and slipping motion of different machines and devices is highly promising. In distinction from metal parts, they do not require lubrication, are capable of operating in a vacuum and at a great jump in temperature (from -200 to +300 degrees C), combining the properties of hard lubricants and construction materials.

The "Aman", "Tesan", "Esteran", "Vilan" and other brands of antifriction self-lubricating plastics (ASP-plastics) developed at the USSR Academy of Sciences Institute of Element-Organic Compounds have a set of needed properties--primarily heat-resistance and thermal stability, oil and gas resistance and resistance to radiation exposure and technological feasibility in processing.

The polymers referred to are the materials of the present day. Despite all the good qualities in them, we still have not succeeded in realizing all the theoretical possibilities, primarily strength. Ultrastrong polymers are the materials of the future, possibly of the near future, since an intensive search is being conducted in this direction. Modern equipment is enabling scientists not only to study the internal structure of polymers in greater depth but also to modify it in a purposeful way.

How is this accomplished?

In order to create a maximally strong polymer the macromolecular chains which in ordinary polymers are in the form of an intricate knot must be stretched out, oriented, placed upright and densely "packed". It is

well known that a high degree of orientation of molecular chains is noted in the natural fibers woven by, say, spiders and silkworms--although there are still many deviations even in these. But can such a high degree of orientation be achieved artificially?

Soviet scientists and their foreign counterparts are answering this question in the affirmative. Laboratory specimens of a high-strength oriented polyethylene the strength of which exceeds the strength of flexible steel wire 2.5-fold have already been obtained. Work has been begun with other, more heat-resistant polymers. Here it must be remembered that the existing technology makes it possible to give polymers strength in one direction only--lengthwise. The scientists' next problem is to achieve ultrastrength of polymer materials in other directions, that is, by means of biaxial stretching.

Another highly important aspect of this problem is giving ultrastrong polymer materials high thermic characteristics so that they rival metals not only in strength but also in heat resistance. Extensive research is being conducted in this direction with the chief objective of developing scientific bases for creating heat resistance and thermal stability of polymer structures.

On the basis of the theoretical premises obtained, work is already being conducted on the synthesis ofprocessed polymers with a rigid structure which do not disintegrate below the melting point and which after processing and thermal treatment form three-dimensional ladder-like structures which ensure their high thermal stability. New polymers with unique properties have been obtained and are being investigated. First and foremost among them, we should mention the polymer "Karlin", first synthesized in our laboratory, which by its structure and physico-chemical properties occupies an intermediate position between graphite and diamonds.

The new ultrastrong polymers with high thermal stability--the second generation polymers--should not be viewed merely as substitutes for ordinary materials in customary, traditional use. They will give their own exploitation characteristics, and this in turn will mark a completely new approach to the solution of different scientific and technical problems and will further expand the horizons of our possibilities.

In the world today hundreds of thousands of researchers are working in the field of polymer science. Soviet scientists have made and are making an important contribution to its progress. The achievements of polymer science have enormous commercial and economic significance and are conducive to an increase in labor productivity and a rise in the prosperity of the Soviet people.
[69-9380]

9380
CSO: 1841

DEVELOPMENT OF POLYETHYLENE FILMS FOR AGRICULTURE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 19 Oct 79 p 2

[Article by O. Berezhnaya: "Wonder Films"]

[Text] We are standing in the product showroom of the Plastic Scientific Production Association. Under the clear, spherical showcases are the association's products: plastic radio and television parts, the instrument panel of Zhiguli's; familiar packages and little cans with the inscriptions "sour cream", "cheese", "cottage cheese"--packages for dairy products; polyethylene film 40 times finer than a human hair; tubes half a meter in diameter and quite thin ones--for the cable industry.

And here are rolls of polyethylene film. On the signs I read, "Distinguished by increased transparency...", "has higher than usual heat resistance...". The use of these films in agriculture is securing a 1,5-2-fold rise in crop yields and early ripening of agricultural crops.

Later I met the creators of the films for the countryside: the laboratory supervisor, T. Itskova; the topic supervisor, Master of Chemical Sciences Ye. Samokhina; the senior scientific staff member, Master of Technical Sciences M. Morozova, and engineer V. Aver'yanova. Three years ago they began work on the creation of special agricultural films to replace conventional film, about which rural workers had made many complaints.

They began by testing colored films. Experiments indicated that certain varieties of lettuce grow better under blue film, and experimental groups of tomatoes gave a more abundant yield under orange. By varying the color and, at the same time, the lighting as well, it is possible to obtain remarkable results. Once they even "succeeded" in growing flowers... without petals. But such film was more suitable for scientific research--its "specialization" was too narrow for state and collective farms.

Foamed film proved to be much more effective. In hot weather it is cool in hothouses covered by such film, and the porous structure diffuses sunlight and protects plants from direct rays. On the other hand, at

night the temperature is 2-3 degrees higher under the film than in the open air. It also retains moisture. Its creators have received a silver and three bronze medals of the USSR VDNKh [Exhibition of the Achievements of the USSR National Economy"].

The chemists' next innovation looks unusual--a black film. As Ye. Samokhina explained to me, its purpose is not to transmit sun rays. The film is spread out directly on the ground and seedlings are transplanted in cuts. Weeds do not grow under it, and moisture does not evaporate. Consequently, the bed does not need to be either watered or weeded. It will have wide application in the planting of potatoes. The first prototypes of machines which will simultaneously spread film and transplant potatoes have been developed. The crop can be planted shallowly, and hilling is not necessary--the tubers will be reliably protected from the light.

And, of course, one of the latest works is photodisintegrating film. A graft is made on an apple tree and wrapped with film--and it is not necessary to remove the "bandage": it disintegrates by itself with time. And the film can be programmed for disintegration for any period of time: if necessary it will disintegrate in a month; if necessary, in half a year.

Ninety-five million rubles have been given to the government in the eight years of the association's development. Two hundred thirty inventors' certificates have been received; three licenses have been sold abroad; nine works have been patented abroad. Minute condensers, tubes, different parts.... And this remarkable film, which is helping to raise and preserve the harvest.
[69-9380]

9380
CSO: 1841

USSR UDC 678.686]01:53

NEW CYCLOALIPHATIC EPOXY OLIGOMERS

Moscow PLASTICHESKIYE MASSY in Russian No 10, 1979, submitted 2 Jun 78 signed to press 25 Sep 79 pp 6-9

BATOG, A. YE., KOZLOVA, I. V., STEPKO, O. P. and DURMANENKO, N. A.

[Abstract] Some new cycloaliphatic epoxy oligomers containing an amide group were synthesized and described. Polymers based on these oligomers are heat resistant and thermostable with high physico-mechanical characteristics. These oligomers are recommended for use in developing heat resistant compounds, glues and bonding agents for reinforced plastic to be used at high temperatures. References: 6; Figures: 2.
[72-2791]

USSR UDC 678.686]01:53

POLYMER MATERIALS BASED ON ALICYCLIC TRIEPOXIDES AND TETRAEPOXIDES

Moscow PLASTICHESKIYE MASSY in Russian No 10, 1979, submitted 13 Jul 78 signed to press 25 Sep 79 pp 9-10

BATOG, A. YE., PET'KO, I. P., KOZLOVA, L. V., and PANDAZI, I. F.

[Abstract] New alicyclic triepoxides and tetraepoxies based on complete acylation of polyols by unsaturated hydroaromatic acids or their anhydrides were synthesized to verify the assumption that compactly structured alicyclic epoxies containing several esterized groups may form, upon hardening, heat resistant polymers with satisfactory strength and elasticity. This was verified and it was suggested that these epoxies may be used to produce heat resistant, high-strength sealing compounds and impregnation compounds and bonding agents for reinforced plastics. References: 4; Figures: 3.
[72-2791]

USSR UDC 678.742.2:66.097:539.2

EFFECT OF COMPOSITION AND STRUCTURE OF COMPLEX HETEROGENIC CATALYSTS ON MOLECULAR STRUCTURE AND PROPERTIES OF POLYETHYLENE

Moscow PLASTICHESKIYE MASSY in Russian No 10, 1979 submitted 28 Mar 78 signed to press 25 Sep 79 pp 11-13

SEMENOVA, S. A., GRIGOR'YEV, V. A., LEYTMAN, M. I., ANDREYEVA, I. N., KALIVAYKO, YE. I., POLYAKOV, A. V., KOROBOVA, N. M. and STEFANOVICH, L. G.

[Abstract] A study was made of the possibility of directional regulation of the structure and properties of high density polyethylene produced with the use of catalysts with different structures and properties. Connections between the type of heterogenic catalyst used, the structure of polymers produced by the use of the different catalysts and the physico-mechanical properties of these polymers were discussed and compared. References: 20; Figures: 3.
[72-2791]

USSR UDC 678.027.073.046.076

NEW TECHNOLOGY FOR PRODUCING PRODUCTS FROM THERMOPLASTICS REINFORCED WITH A CONTINUOUS FIBER

Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 5, 1979 pp 18-21 manuscript received 17 Apr 79

SHOROKHOV, V. M. and SHEVLYAKOV, A. S., Ukrainian SSR Academy of Sciences Institute of High Molecular Compounds

[Abstract] A description is given of a technology which makes it possible to produce large thin-sheet complex-relief products out of polymeric composite materials with a thermoplastic matrix reinforced with continuous fibers with an orthotropic or anisotropic arrangement and a maximum fiber content of 80 percent by weight. Essentially, the method consists in hot forming in an intermediate product rig an intermediate product produced by weaving methods, according to the technology for knitted and inserted materials or by winding on, from continuous reinforcing and continuous matrix fibers made of thermoplastic polymers. In the forming process, the polymeric fibers, evenly arranged between the reinforcing fibers, are converted by heating into a melt which impregnates the reinforcing fibers under the forming pressure in the enclosed space of the rig. The melt hardens by cooling without removing the pressure, and the intermediate product is changed into a polymeric composite material product with a thermoplastic matrix, whose form is governed totally by the rig. Trapped

air is excluded by evacuating the space containing the intermediate product during the heating process and then pressing the product with the moving forming portion of the rig. The resulting void content is not greater than three percent by weight. This technology represents maximum simplicity, and is performed on equipment for hot vacuum forming of products made of polymeric composite materials with a thermosetting matrix, without any further improvement of this equipment. The new technology is called the "nonimpregnation" method, since the intermediate product and the final product are produced without the use of resinous and liquid components or solvents and the operation of impregnating the continuous reinforcing fibers with the polymer melt is performed in the closed rig and is combined with forming the product. On an experimental rig developed by the authors were fabricated by the hot vacuum forming method sheets of continuous glass fiber reinforced polyformaldehyde, Lavsan (polyethylene terephthalate), polyporpylene and polyamide (Kapron) with a different ratio of reinforcing and matrix fibers in the form of multifilament threads. The characteristics of different intermediate products for the nonimpregnation technology are given in a table. In another table are given the physico-mechanical properties of the polymeric composite materials produced, along with technological parameters of the forming process. Having the greatest influence on the properties of glass reinforced thermoplastics are the type of polymer and reinforcing fiber, the degree of filling and the texture of the intermediate product. The best physicomechanical properties are exhibited by materials made from intermediate products with a separate arrangement of high-modulus glass and Lavsan polymeric reinforcing threads. The new technology, as opposed to the old method of using poured thermoplastics, results in higher strength characteristics for reinforced thermoplastics. The employment of a vacuum in hot forming results in high density and low water absorption. References 8 Russian.
[41-11,176]

USSR UDC 678.026.3

ELECTROPHORETIC POLYMERIC COATINGS BASED ON SILICONES

Kiev KHIMICHESKAYA TAKHNOLOGIYA in Russian No 5, 1979 pp 25-26 manuscript received 20 Jun 77

TERTYKH, L. I., DEYNEGA, YU. F., VARLAMOVA, N. V., SEVERNYY, V. V. and ZAMANSKIY, A. A., Ukrainian SSR Academy of Sciences IKHKHIKHV [expansion unknown] and USSR Ministry of the Chemical Industry

[Abstract] By electrophoresis coatings have been produced which are based on silicone resins containing ethoxyl and hydroxyl radicals as functional groups. The addition of OC_2H_5 and OH groups ensures chemisorptive interaction with the surface of the electrode and thus improves the coating's adhesion. The results are given of an investigation of processes of the

formation of stable and charged dispersions of resins 133-34 and 133-53, having an R:Si ratio of not greater than 1.8, and of conditions for their precipitation in an electric field. Concentrated emulsions (15 percent) of resin 133-34 were produced with a UZDN-1 unit at a frequency of 22 kHz. Cetyltrimethylammonium bromide, a cation-active surface-active substance, was used as the stabilizer and charger in a quantity of 0.13 percent by weight in relation to the dispersed phase. With an optimal sonic irradiation strength and an anode current of 70 mA, a study was made of the influence of the dispersion time on the stability of emulsions formed. The results are given for a determination of the influence of the duration of sonic irradiation on the formation of a 15 percent emulsion of resin 133-34 in water; the optimal sonic irradiation time is 45 s. Stable emulsions do not form in a shorter period. Data are given illustrating the influence of the concentration of the dispersed phase on the electrical properties of an emulsion of 133-34 in water. A change in the concentration of the dispersed phase does not exert a noticeable influence on the electrokinetic potential of an emulsion of resin 133-34. The optimal conditions for producing continuous uniform coatings are a concentration of a two to four percent emulsion, a current density of 0.1 to 1.0 mA/cm^2 and a settling period of from one to nine minutes. The coatings produced have a thickness of 1 to 20 depending on the settling time. With current densities greater than 1 mA/cm^2 the dispersed phase coagulates in the cell. Concentrated emulsions of greater than 80 percent result in the formation of thick films which fell apart when removed from the cell. The coatings were heat treated at 200 to 250°C. Stable dispersions of silicone resin 133-53 were produced by salting out the resin from acetone in an aqueous solution of cetyltrimethylammonium bromide. The high viscosity of the resin made ultrasonic dispersion ineffective. Stable dispersions were produced with a resin content of 1.3 to 2.2 percent and an electrokinetic potential of 50 to 55 mV. A table is given of the key characteristics of the properties of coatings based on silicone resins 133-34 and 133-53. Adhesion is shown to be much better in these resins than in resins based on polyethylhydrosiloxane. Resins 133-34 and 133-53 have good adhesion and good water repellent and electrical insulation properties. Figures 2; references 7 Russian.
[41-11,176]

USSR UDC 632.9:635

ACHIEVEMENTS AND PROBLEMS OF THE CHEMICAL METHOD OF CONTROLLING DISEASES OF AGRICULTURAL CROPS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 9, 1979 pp 13-16

KOBAKHIDZE, D. M., All-Union Institute for the Protection of Plants

[Abstract] Selection and efficient application of fungicides against a combination of diseases were considered only with regard to periodic outbreaks of the diseases during the 1930s-1940s. Up to 1961 only copper- and sulphur-containing fungicides such as bordeaux liquid, copper sulfate and ground and colloidal sulphur were used, while organic mercury preparations of granosan and mercuran were used as seed disinfectants. The economic significance and potential harm of the disease, the dynamics of development during the vegetation period, the specifics of the host and parasite relationships, symptoms of a diseased plant and the characteristics of action of toxic substances on the pathogenic agent of the disease are taken into account when developing a scientifically based variety of fungicides and seed inoculants. Potentially harmful Bordeaux liquid has been replaced by effective substitutes such as zineb, polycarbacin, polymarcin, captan, phthalan and carpene while combination copper-containing organic fungicides include cuproxan, cuprocin-1 and polychom. Organic fungicides such as karatan, morestan, morocide, akreks and also wettable colloidal sulphur powder have been recommended to control powdery mildew of various agricultural crops. Fungicides of systemic action occurred toward the end of the 1960s. The practice of chemical immunization of plants was also effective against loose smut of grain crops, pyriculariosis of rice and late blight of potatoes. The domestic preparation EF-2 can be used in combination with TMTD or HCB as a replacement for mercury-containing seed disinfectants and for complex protection of grain crops against covered smut and crown rot. Systemic preparations of seed disinfectants such as vativax protects grain crops against covered smut and increases the yield by 3-4 qt/ha. The use of systemic preparations in combination is effective in protecting grain crops against covered smut, powdery mildew and rust. Suspensions of the systemic fungicides benomil, uzgen and fundasol by flooding the soil under the plants proved effective in controlling various diseases of vegetable crops. Fundasol and nitragine are also promising for joint treatment of soybean seeds. The number of treatments of fruit crops can be reduced if systemic fungicides are used in combination with surfactants or if the wintering-over stages of the pathogenic agents of the diseases are destroyed by treating the trees after harvest. Some pathogenic fungi develop resistance to systemic fungicides with extensive use of them. References 12 Russian. [53-6521]

USSR UDC 632.951

THE EFFECTIVENESS OF PYRIMOR, AKTELLIK AND PP-199 AGAINST APHID VECTORS OF POTATO VIRUSES

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian Vol 17 No 9, 1979 p 20

LODOCHKIN, L. I., All-Union Institute for Protection of Plants

[Abstract] Pyrimor, PP-199 and Aktellik were tested under field conditions in 1977-1978 at the Tolstopal'tsevo Experimental Demonstration Farm of Moskovskaya Oblast to determine the effectiveness against aphid vectors of potato viruses. The plants were sprayed when wingless aphids appeared on the leaves. The rate of application was 400 liters per hectare of working liquid, the area of the experimental plot was 25 m^2 and the repetition was fourfold. The aphids were counted on 100 leaves of 100 plants every 10, 20 and 30 days after treatment. The initial infestation of the potatoes and later infestation were determined by the serological method. The yield was counted for 100 plants in each variant. Pyrimor at rates of 1.2 and 2.0 kg/ha reduced the number of aphids on the potato leaves to single specimens, as a result of which the infestation of the plants by virus M was reduced by a factor of three compared to the control. The infestation of the leaves by viruses X and S did not change appreciably. Application of pyrimor at a rate of 2.0 kg/ha reduced the potato yield, while the yield remained the same as the control at a rate of 1.2 kg/ha. Aktellik reduced the infestation of plants by virus M by 24 percent in a concentration of 0.05 percent and by 40 percent with a concentration of 0.075 percent. Preparation PP-199 in a concentration of 0.005 percent did not reduce the infestation of plants by viruses and the number of aphids. A concentration of PP-199 of 0.05 percent reduced the infestation by 16 percent and the number of aphids on the leaves was reduced, while the yield of tubers was increased. Pyrimor is most effective at rates of 1.2-1.5 kg/ha against aphid vectors of potato viruses. [53-6521]

USSR UDC 632.952

TMTD AS A SEED DISINFECTANT

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 9, 1979 pp 22-23

ANDREYEVA, YE. I., All-Union Scientific Research Institute of Chemicals Used for Plant Protection

[Abstract] Tetramethylthiuramdisulfide in an 80 percent wettable powder is a finely dispersed yellowish or gray substance with irritating effect and marked accumulation used at a rate of 400 mg/kg against rats and

210 mg/kg against rabbits. The maximum permissible concentration of the preparation in the air of production spaces is 0.5 mg/m^3. TMTD is used to treat seeds against various types of fungal-bearing pathogenic agents which cause mold, smut and blight and beronosporosis in various types of crops. The preparation also stimulates the development of plants and increases yield. The preparation is used to protect the seeds and sprouts of corn, legumes, commercial, medicinal, flower and other crops against the pathogenic agents of disease. Conditioned seeds are treated prior to sowing on the farms or in specialized shops at plants at the rate of 1 kg of TMTD and 5 liters of water per ton of seed. The rate of application is 30 kg/ton when treating cotton seeds against the pathogenic agents of mold and root rot. Since TMTD is not active against many bacterial types of pathogenic agents such as bacterial blight of cotton, the cotton seeds should be additionally treated with 20 percent copper trichlorophenolate powder after treatment with TMTD. Protective-stimulation compositions which include TMTD at the rate of 5 kg/ton are used to treat sugar beets. The preparation is used at different rates of application to treat seeds on farms from 1.5 to 2 kg/ton for corn, sorghum, flax, peas, wheat and rye to 6 to 8 kg/ton to treat cabbage, tomato, table beet and carrot seeds. A preparation of 80 percent wettable TMTD powder is also used to treat potatoes at the rate of a 3 percent suspension calculated at 60-70 liters per ton and to treat carrot seeds at the rate of 6-8 kg/ton prior to winter storage and planting in the soil on seed plots. TMTD provides the best protection when treated seeds are planted in cold soils and during a cold spring and the protective properties of the preparation are retained for more than 30 days in the soil. TMTD can also be mixed and used with different chlorinated and other pesticides, growth-stimulating substances and trace elements. It is not recommended that the preparation be used to control diseases of vegetating plants due to its high stability and low rate of decomposition on the plants. Personal and public safety rules must be strictly observed when working with the substance by using various types of respirators, special types of safety glasses and dust-impermeable cotton overalls, cotton gloves with special coating and rubber boots. Treated seed must not be used for food or commercial purposes or for feeding cattle. Treated grain must be stored in specially adapted warehouses and can be used for planting the following year if good sprouting of the seeds is first determined. [53-6521]

USSR UDC 632.954

THE MAIN STAGES OF HERBICIDE STUDY

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 9, 1979 pp 24-27

VOYEVODIN, A. V., All-Union Institute for the Protection of Plants

[Abstract] Various types of carbamate preparations, organic compounds, aliphatic compounds, derivatives of triazine and urea and other compounds

numberin more than 400 individual substances which manifest herbicidal properties and several thousand preparative forms including mixtures of herbicides have been developed since the 1940s. The techniques of producing the main types of herbicides, methods of application and also medical and sanitation-hygienic support of work with herbicides have been worked out. The procedures for development of herbicides follow the main trends of forming the assortment of preparations, biological justification of their use and solution of technical problems at the Laboratory of Herbicides of the All-Union Institute for Protection of Plants. The herbicides, both domestic and foreign, undergo state trials at toxicological laboratories of VIZR in various sections of the USSR and also at branch institutes. More than 100 herbicides were recommended for use during 1960-1978 as a result of these trials. In addition to general testing of herbicides for specific types of crops, they are also studied to expand the assortment, to increase the number of herbicides used on vegetating crops and to prevent the undesirable effect of herbicides on entomophages and useful entomofauna and to reduce the storage time of the herbicides in the soil and environment. The main thrust of biological approval is to study the effect of herbicides on the microflora and nutrient conditions of the soil, on the quality of the yield and their capability of being retained in the product, soil and water in residual amounts. The quality of grain such as carbohydrate, protein and vitamin content as a result of using herbicides is within the range of indicators obtained with the use of fertilizers and irrigation and with weather effects and residual amounts of herbicides in the soil are safe for subsequent crops and for the inhabitants of reservoirs. The results of treating 20 varieties of spring wheat and also barley and oats with optimum doses of 2,4-D at the rate of 0.8 kg of amine salt per hectare showed a correlation between the plant resistance to the herbicide and the growth intensity of the above-ground organs and roots, the ratio of their mass and also the degree of bushiness of the plant and the length of the ear. Treatment of spring wheat over several generations with 2,4-D showed deterioration of the grain structure during subsequent reproductions if they were treated during the second and third stages or organogenesis, while the plants were more resistant to the herbicide when treated during the fourth-sixth stages of organogenesis. Treatment of cotton fields with kotoran, diuron and prometrin showed a disruption of vitality of the palnts during subsequent treatments after the first treatment, which indicates adaptation of the cotton to the herbicides. A three-year study of four potato varieties with arezin, prometrin, patorin and meturine at rates of 2.5 kg/ha and of zenkor at rates of 0.75 kg/ha showed that the quality of the tubers was not affected either during harvest or after prolonged storage. Herbicides applied to root crops such as radishes, carrots and beets inhibit somewhat the development of sprouts during growth and differentiation of the axial organs in length, intensive development of roots and development of the xylem, but eccelerate and stimulate the development of these crops during later periods of sprout development. Herbicides had a slightly inhibiting effect on the

development of various types of food, sugar and table beets during their early growth, while they stumulated the later growth. The phosphorus content of spring wheat and barley was reduced upon application of 0.8-1.2 kg/ha of the sodium salt of 2,4-D, while the phosphorus content of the lipid fraction was reduced, while the phosphorus content of the mineral and residual fractions were increased in barley, peas and wheat upon application of 2,4-D and simazine. The protein, DNA and RNA content of spring wheat was reduced while DNA-RNA complex was slightly disrupted upon application of the sodium salt of 2,4-D. The neoformation of nucleic acids was stimulated in peas during the first stages of development after application of simazine, but the process was suppressed as the herbicide was accumulated in the leaves and the ribonuclease activity was simultaneously reduced somewhat. Technological procedures of using herbicides are studied to a lesser extent since VIZR does not have the capabilities to work out these procedures. The chemical method of controlling weeds in plantings of grain crops such as corn, commercial crops, vegetables, vineyards and fruit orchards and fodder crops is being developed by the Laboratory of Herbicides of VIZR. References 36: 35 Russian; 1 Western.
[53-6521]

USSR UDC 631.547:635.656

THE USE OF CHLOROCHOLINECHLORIDE TO INCREASE THE DROUGHT RESISTANCE AND PRODUCTIVITY OF PEAS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 9, 1979 pp 27-29

DOLGOPOLOVA, L. N. and LAKHANOV, A. P., All-Union Scientific Research Institute of Legume-Grain and Groats Crops

[Abstract] The effect of chlorocholinechloride on increasing the productivity and drought resistance of peas was studied with respect to the cultivation technique. Field and vegetation experiments were conducted during 1972-1977 in Orlovskiy Rayon of Orlovskaya Oblast with peas of varieties Uladovskiy 303, Ul'yanovskiy 68, Gor'kovskiy 186 and Kormovoy 24. The soil was dark gray loessy and the soil moisture content was maintained at 70 percent of total moisture capacity during the vegetation experiments. Irrigation was stopped during the budding-blooming phase, which created a drought situation lasting for seven days. The moisture content of the soil decreased to 20-25 percent of total capacity during this period. Irrigation was then restored and the optimum moisture content of the soil was maintained until the end of the vegetation period. The area of the plantings during field experiments comprised 20 to 100 m^2 and the frequency was 4-5. The domestic preparation tur was used as a retardant by spraying the plants in concentrations of 0.00002-0.5 percent

at the rate of 800 liters/ha and 1-24 percent at the rate from 3-0 to 25 liters/ha, by wetting the seeds in tur solutions in concentrations of 0.0002-2 percent for 10 hours, by semi-dry treatment of the seeds with a suspension of the preparation in concentrations from 1 to 50 percent and by application of tur to the soil at rates of 2-12 kg/ha. The control plants were sprayed with water. Application of the preparation at a rate of 6 kg/ha to the soil prior to pruning the crop was the best method of treating peas with tur, resulting in a seed and straw yield 30 percent above the control. The most effective method of spraying was treatment with a 0.5 percent tur solution at a normal rate of 4 kg/ha and the use of a 1 percent solution when the seeds were wetted, which resulted in an increase of productivity of peas during the drought period by 11-12 percent as compared to the control. The most optimum period of spraying peas with the tur is the beginning of the budding stage. An increase of the yield was observed in field experiments even when the plants were treated during later development phases such as blooming and grain formation. When the seeds were treated with a 30 percent tur suspension prior to planting, the grain and straw yield increased by 50.9 and 78.0 qt/ha, respectively, compared to 45.5 and 70.0 qt/ha for the control, while the crude protein content in the grain remained unchanged. The use of tur in all the tested doses and various methods of treatment was safe in the toxocological sense. References 12: 8 Russian, 4 Western.
[53-6521]

USSR UDC 581.192.7:633.511

THE EFFECT OF CROTONOLACTONE ON COTTON PRODUCTIVITY

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 9, 1979 pp 18-20

RAKHMANOV, R. R., DZHURAYEV, O., ABRAMYANTS, S. V., LATASHKO, V. M., RADOVSKAYA, L. A. and KUL'NEVICH, V. G., Krasnodar Polytechnical Institute

[Abstract] Crotonolactone preparation produced by processing the plant wastes of furan compounds was tested as a biological stimulator during 1973-1974. The optimum results under laboratory conditions are achieved when cotton seeds are treated with a 0.05 percent aqueous solution of crotonolactone. The sprouting energy of treated seeds was increased by 9-10 percent and the length of the shoots was increased by 18.7 mm. Field experiments were conducted on the Kolkhoz imeni N. Niyazov of Yangi-Yul'skiy Rayong of Tashkentskaya Oblast on typical serozem soil with deep ground water deposits and on the Sovkhoz imeni Pyatiletiya Uzbekistan of Nizhnechirchikskiy Rayon of Tashkentskaya Oblast on meadow soil with shallow deposition of ground waters. The frequency of the experiments was four and the varieties of cotton were Tashkent-1 and

Tashkent-3. Sprouts appeared earlier in the cotton when the seeds were wetted in a 0.05 percent solution of crotonolactone prior to planting compared to wetting the seeds in water and true leaves also appeared earlier. Twenty-six percent of the plants treated with crotonolactone had bloomed at the beginning of the blooming stage, while only 17 percent in the control had bloomed. Those cotton plants treated with the biological stimulator had 72 percent of bolls that opened up compared to 56 percent in the control. The yield of cotton was increased by 2-3 qt/ha on plots treated with crotonolactone at the Kolkhoz imeni N. Niyazov, while the increase of yield was 1.5-2 qt/ha at the Sovkhoz imeni Pyatiletiya Uzbekistan. The cotton plants were also sprayed with 0.05 percent solution of the preparation during the budding and blooming stage. This produced an additional increase of yield and also an increase of the oil content of the cotton seeds. Crotonolactone produced from furfurol and the waste cube resins from its production also had a stimulating effect on the growth, development and productivity of agricultural crops. Field experiments were conducted on the Kolkhoz Leninskiy Put' of Verkhnechirchikskiy Rayon of Tashkentskaya Oblast during 1976-1977 to study the effect of raw crotonolactone on the yield of cotton. The experiments were conducted on a plot of two hectares with cotton of Tashkent-1 variety and repetition of four. The seeds were wetted prior to planting in a 0.05 percent solution of raw crotonolactone and the plants were sprayed with a 0.05 percent solution during the budding stage. The yield of raw cotton was increased by 1-2 qt/ha when the seeds were wetted with crotonolactone prior to planting, while the yield of raw cotton was increased by 1.8-2.5 qt/ha and the oil content was increased by 0.68 percent with a combination of pre-planting treatmnnt and top dressing of the cotton during budding with raw crotonolactone. The preparation also had a positive effect on the strength and length of the cotton fiber. References 8 Russian.
[53-6521]

USSR UDC 632.954:633.11

THE USE OF DICURAN AND SIMAZINE ON WINTER WHEAT PLANTINGS IN RYAZANSKAYA OBLAST

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 9, 1979 pp 31-32

PESHKOVA, G. P., Ryazan Medical Institute and ULINA, A. I., Ryazan Agricultural Experiment Station

[Abstract] Dicuran and simazine were used on winter wheat plantings of variety Miranovskaya-808 at the Ryazan Agricultural Experiment Station during 1975-1977. The rates of application were 2-3 kg/ha of dicuran and 0.25-1 kg/ha of simazine. The soil of the experimental plot was dark gray loessy heavy loam with humus content of 3.4 to 3.6 percent

in the 0-20 cm layer, available phosphorus content of 8.9-10.3 mg, exchangeable potassium content of 11.0-11.5 mg, total absorbed bases of 22-24 mg-eqv per 100 grams, pH of 5.4-5.5 and hydrolytic acidity of 3.7-4.1 mg-eqv per 100 grams of soil. The meteorological conditions during the three years of testing were mainly favorable for winter wheat crops, ranging from 382 mm in 1975 to 468 mm in 1976. Spring periods were characterized by warm weather with sufficient precipitation. The increase in grain yield due to use of the herbicides averaged 4.2 qt/ha during the three years of use of dicuran and 3.0 with use of simazine. Rates of application of 2.5 kg/ha of dicuran increased the grain yield by an average of 5.4 qt/ha over the three years, while the best rate of application of simazine of 0.75 kg/ha increased the average yield by 4.3 qt/ha over three years. Use of the herbicides had no appreciable effect on grain quality except an increase of protein content was observed with application of dicuran at the rate of 3 kg/ha. The herbicides had a 70 percent toxic effect on young weeds, but their effect on perennials was insignificant. No residual amounts of the herbicides in the wheat grain were detected by the thin-layer chromatographic method.
References 5 Russian.
[53-6521]

USSR UDC 547.461

BISCHLORPHOSPHAZOCARBACYLS

Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 5, 1979 pp 15-17

RUDAVSKIY, V. P.

[Abstract] For the purpose of continuing a study of the biological activity of phosphorylated derivatives of dicarbonic acids, bischlorphosphazocarbacyls were produced by the phosphazo reaction method. Diamides of dicarbonic acids with phosphorus pentachloride produce bistrichlorphosphazocarbacyls. A convenient method of preparing bistrichlorphosphazocarbacyls is to react diamides of dicarbonic acids with phosphorus trichloride and chlorine or pure phosphorus and chlorine. For this purpose dry chlorine is admitted into a mixture of a diamide of dicarbonic acid, phosphorus trichloride or pure phosphorus and a solvent. Alkyl(aryl)tetrachlorphosphorus and diaryltrichlorphosphorus react with diamides of dicarbonic acids in a similar manner to phosphorus pentachloride, but at higher temperatures. Reacting diamides of dicarbonic acids with aryldichlorphosphide and chlorine is cited as a method of preparing bisaryldichlorphosphazocarbacyls. Bisalkyl(aryl)-dichlorphosphazocarbacyls are formed by interacting alkyl(aryl)tetrachlorphosphorus with diamides of dicarbonic acids. Bisdiarylchlorphosphazocarbacyls can be produced by two methods: by interacting diaryltrichlorphosphorus with diamides of dicarbonic acids, and by admitting

chlorine to a mixture of a diamide of dicarbonic acid and diarylchlorphosphine. Diamides of dicarbonic acids can be react d with phosphorus pentachloride and its derivatives without a solvent at atmospheric pressure in a 300 to 400 mm Hg vacuum or in solvents such as carbon tetrachloride, benzene, chlorobenzene and nitrobenzene. The use of a solvent results in higher yields and a purer product. Bistrichlor-, bisalkyl(aryl)dichlor-, and bisdiarylchlorphosphazocarbacyls are relatively low-melting crystalline substances or thick fluids which crystallize in two to four hours. Some bischlorphosphazocarbacyls do not crystallize even after 24 h and remain as thick fluids. All bischlorphosphazocarbacyls dissolve easily in benzene, xylene, dioxane and acetone, and with difficulty in ether and petroleum ether. When boiled with an excess of water or a hydrous alcohol, bistrichlor-, bisalkyl(aryl)dichlor- and bisdiarylchlorphosphazocarbacyls disintegrate into diamides of dicarbonic acids, phosphoric, alkyl(aryl)phosphonic and diarylphosphinic acid and hydrogen chloride. In the presence of traces of hydrogen chloride, bischlorphosphazocarbacyls disintegrate even at room temperature. It is thus necessary quickly to remove hydrogen chloride from the reaction medium in the synthesis of bischlorphosphazocarbacyls. Given in detail are the methods of producing bistrichlorphosphazocarbacyls, bisalkyl-(aryl)dichlorphosphazocarbacyls, and bisdiarylchlorphosphazocarbacyls. Also described are the hydrolysis of bistrichlor-, bisalkyl(aryl)dichlor- and bisdiarylchlorphosphazocarbacyls to diamides of carbonic acids, the thermal disintegration of bistrichlor-, bisalkyl(aryl)dichlor- and bisdiarylchlorphosphazocarbacyls, and the effect of hydrogen chloride on bistrichlor-, bisalkyl(aryl)dichlor- and bisdiarylchlorphosphazocarbacyls. References 3 Russian.
[41-11,178]

ACHIEVEMENTS OF INSTITUTE OF PETROCHEMICAL PROCESSES DISCUSSED

Baku BAKINSKIY RABOCHIY in Russian 25 Oct 79 p 2

/Article by V. Aliyev, academician of the Azerbaijan SSR Academy of Sciences, director of the Institute of Petrochemical Processes, the republic's honored man of science and technology: "The Flagship of Petroleum Refining and Petrochemistry"/

/Text/ One of the country's most outstanding research institutes--the Order of the Red Banner of Labor Institute of Petrochemical Processes imeni academician Yu. G. Mamedaliyev of the Azerbaijan SSR Academy of Sciences--is 50 years old. The Aznefti Central Chemical Laboratory subsequently reorganized into the Azerbaijan Scientific Research Institute for Petroleum Refining imeni V. V. Kuybyshev was the predecessor of the Institute of Petrochemical Processes.

From the first years the institute paid much attention to the study of the composition and systematization of Azerbaijan's high-grade unique petroleum. This made it possible to recommend the most efficient directions in its processing. The investigations conducted in the 1930's led to the introduction of tubular petroleum refining units, including pyrolytic ones, highly productive for that time into the industry. Original processes for the production of low-cold-test aviation and automotive oil and of such important petrochemical products as aromatic hydrocarbons and ethyl alcohol were developed.

The Great Patriotic War was an important landmark in the institute's history. As is well known, at that time Azerbaijan was the main supplier of fuel and oil in the country. Naturally, all scientific research was subordinated to the task of providing the front and rear with high-grade fuels and lubricants. The institute's scientists have a right to be proud of the fact that they made a worthy contribution to the cause of victory of the Soviet people over fascism. They developed and introduced processes for the production of high-octane aviation gasoline, high-octane gasoline additives, nitrotoluene and so forth.

During the postwar period, when the country restored the national economy and new types of engines appeared, an attempt to provide them with new types of fuel and oil was clearly defined in the institute. Scientists embarked on the development of theoretical principles of thermocatalytic refining of crude petroleum. As a result, an original technique of the "fluidized" bed of the catalyst was proposed. This was the first process in the USSR making it possible to greatly increase the raw material resources of high-octane gasoline for aviation and motor transport on the basis of middle and heavy petroleum cuts, which did not find skilled application.

The same process also gave valuable raw materials--reactive gases--to petrochemistry. Later seven units were built in the Soviet Union and two, in Poland and Rumania. All the facilities have been in operation up to now. These investigations became a solid foundation for the introduction of the technique and technology of the fluidized bed in the petroleum refining and petrochemical industry and in nonferrous metallurgy.

Owing t the long-term study of the problem, it was possible to develop and introduce the first domestic additives, which greatly improved the operating qualities of lubricating oil.

One of the most important trends in the institute's activity in the 1960's led to the development of a method of refining paraffin petroleum. It made it possible to organize the production of low-cold-test jet and diesel fuel, low-viscosity oil and paraffin of a high degree of purity. The process gained recognition. It is used at enterprises in Novokuybyshevsk, Ufa, Moscow and Baku. Plans are made to carry it out at another four plants.

In the last 2 decades, in order to improve the quality of motor and diesel oil from Baku petroleum, whose composition and properties changed sharply, the Institute of Petrochemical Processes propcsed combined processes including deasphalting, deparaffination and selective cleaning. The methods were introduced in Azerbaijan.

Of great scientific and practical interest are the processes of obtaining from the petroleum gas butane and isopentane divinyl and isoprene respectively--the source material for large-capacity facilities for the production of synthetic rubber. The biggest plants of Azerbaijan and the Russian Federation mastered them. Petrochemistry was able to give up the use of a vast amount of food products as raw materials and now they are used according to their direct purpose. At the same time, the production of rubber greatly increased in the country and production costs were lowered.

In cooperation with the All-Union Aluminum and Magnesium Institute and Azgiproneftekhim the process of roasting and reducing alunite ore in the "fluidized" bed was developed for the first time in world practice. This

made it possible to establish in Kirovabad a large-capacity production of alumina (aluminum raw material), sulfuric acid and potassium fertilizers from alunite located near the Zaglikskoye deposit. The process was patented in a number of countries and a license was sold.

The staff of the institute together with the republic's State Planning Committee and planning organizations formulated a long-term plan for the further development of the Sumgait industrial region. It envisages the expansion and reconstruction of petrochemical and chemical production facilities, improvement in technological systems, a more efficient utilization of raw materials, reagents, fuel and electric power, output of new types of products, improvement in economic indicators and so forth.

The in-depth investigations conducted at the Institute of Petrochemical Processes in a number of promising directions led to the fact that five independent institutions were organized at the base of some of its laboratories and divisions, that is, institutes of chemistry of additives, of theoretical problems of chemical technology and of organochlorine synthesis, a sector for radiation research of the Azerbaijan SSR Academy of Sciences and the all-Union sectorial institute VNIPIgaz /All-Union Scientific Research and Planning Institute of Gas/. The Institute of Petrochemical Processes is rightly proud of their achievements.

Of the directions and results of their work the scientists at the Institute of Petrochemical Processes consider, for example, contacting-catalytic processes, where advanced, new systems and reagents of an original design with ascending, through and semithrough flows of catalysts are used, important. Such is the catalytic cracking in through and semithrough flow, which increases productivity as compared with the "fluidized" bed by a factor of 8 to 10 and makes it possible to develop machines of a large unit capacity and to reprocess heavy types of raw materials. The process was introduced at enterprises in Baku, Ryazan', Ufa and other cities.

A new variant of the method ensuring the production of the high-grade AI-93 gasoline directly in the process of catalytic cracking of sulfur and nonsulfur raw materials without the use of a toxic lead tetraethyl solution was recommended for expanding application at the country's petroleum plants in the last few years. This is of great importance not only for improving the economic indicators of production, but also for protecting the environment from pollution by the harmful exhaust gases of engines.

The method of obtaining ethylene oxide needed for the petroleum and petrochemical, light and aviation industries, in medicine and in everyday life is among the original methods. The new reactor system developed especially for this technology makes it possible to perform a number of difficultly controlled processes and to build automated small-size machines of a large unit capacity with a considerable reduction in their metal and power intensiveness. The process was accepted for introduction and was patented abroad.

It should be especially noted that the Institute of Petrochemical Processes together with the Kaspmorneftegazprom Association and the Institute of Physics of our academy developed the A-4 reagent, whose practical utilization solves such important problems of nature protection as a complete clearing of drilling and other waste water of industry from petroleum and petroleum products, organization of a system of circulating water supply at enterprises and so forth. The Azerbaijan SSR Council of Ministers adopted a decree on the expanding application of A-4 in the national economy. Thousands of enterprises in the country became interested in this reagent. To meet their need, large-capacity units are now put into operation in the republic.

Of course, in a newspaper article it is impossible not only to discuss all the petrochemical processes developed at the Institute of Petrochemical Processes, but also to enumerate their names. The institute services many industrial sectors, including the perfumery sector, and also works for agriculture. Therefore, let us confine ourselves to several characteristic figures.

A total of 69 processes with an overall economic effect of 74 million rubles were introduced into the industry of the Soviet Union during the postwar period. Realization of a number of other processes with an expected effect of 23 million is envisaged before the end of the 10th Five-Year Plan. All this work is based on fundamental in-depth theoretical investigations by scientists at the Institute of Petrochemical Processes in promising directions of scientific development. A considerable part of the work is done at the level of inventions. In the last 15 years our workers obtained more than 400 authors' certificates and 80 foreign patents. A total of 10 monographs and more than 1,000 scientific articles were published. The experimental industrial plant of the institute with more than 70 technological units is a kind of connecting link between research laboratories and the national economy and contributes to an acceleration of the rates of introduction. Expansion of the list of valuable chemical products of the republic's industry ensures a growth of the national income to a certain degree.

The Institute of Petrochemical Processes helps the petroleum and chemical industry in the training of highly skilled personnel in many specialties not only for Azerbaijan but also for the entire Union, as well as for developing countries--India, Iraq, Burma and others.

For achievements in the development of petroleum refining and for the introduction of highly efficient, new processes into the industry the institute was awarded the Order of the Red Banner of Labor and in connection with the 100th anniversary of the republic's petroleum industry, the Certificate of Honor of the Presidium of the Azerbaijan SSR Supreme Soviet. Dozens of scientists were awarded state prizes of the USSR and the republic.

The achievements of the Institute of Petrochemical Processes were displayed at republic, all-Union and international exhibits, where its work was marked by diplomas and medals.

The staff of the Institute of Petrochemical Processes in all its activity feels the daily attention and help of the Central Committee of the Communist Party of Azerbaijan, the republic's Council of Ministers and the academies of sciences and sectorial chemical ministries of the Union and Azerbaijan.

In the next few years scientists at the institute will have to perform even more complicated fundamental theoretical investigations designed for practical use. We must improve existing production facilities and processes of petroleum refining and petrochemistry, create highly efficient, new catalytic systems, which will make it possible to sharply improve economic indicators, lower power expenditures per unit of output, increase the output of white petroleum products from heavy raw materials and develop measures for the protection of the biosphere. We must still do a great deal in order to solve the main tasks set for scientists by the party and government, that is, to improve the efficiency and quality of investigations and to increase the yield of science for the national economy of our homeland.

We constantly remember and are guided by the order formulated by Leonid Il'ich Brezhnev during the days of celebration of the 250th anniversary of the USSR Academy of Sciences: "... The party expects from scientists an ever deeper and bolder investigation of new processes and phenomena, an active contribution to the cause of scientific and technical progress, a thoughtful analysis of the problems that arise and responsible recommendations for the best methods of solving them in the interest of strengthening the country's power, improving the life of the people and building communism."
[68-11,439]

11,439
CSO: 1841

USSR UDC [621.892.096.1:62-63]025.4

UNIFICATION OF FUELS AND LUBRICANTS - AN IMPORTANT NATIONAL ECONOMIC PROBLEM

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 11, 1979 signed to press 21 Sep 79 pp 3-5

BRATKOV, A. A., NIKITIN, V. V., and RADCHENKO, YE. D.

[Abstract] In view of the present great need for economy in consumption of fuels and lubricants, the authors recommend revision of the existing large assortment of such materials. The absence of state and sectoral standards in classification, the complexity and lethargy in replacing obsolete and useless materials and the absence of a unified chemical motor oil agency for control of proper designations and use of appropriate sorts of fuels, oils, etc., have created the present deficiency in the classification system. This classification can be improved by compilation of a list of obsolete materials to be replaced, development and standardization of a limited list of fuels and lubricants to meet present needs, a plan for testing materials on the unified list and plans for production of the new sorts on scales required. References: 6.
[71-2791]

USSR UDC 62-631.2:629.113

UNIFICATION OF AUTOMOBILE GASOLINES

Moscow KHIMIYA I TAKHNOLOGIYA TOPLIV I MASEL in Russian No 11, 1979 signed to press 21 Sep 79 pp 5-8

LEBEDEV, S. R., AZEV, V. S., KITSKIN, B. P., and MALYKHIN, V. D.

[Abstract] The need for unification of gasolines and the optimization of their performance levels to increase fuel efficiency and economy was discussed and reduction of their differences according to their antiknock values was recommended. Procedures for realizing the unification of automobile gasolines were enumerated. References: 5; Figures: 3.
[71-2791]

USSR UDC 62-634.2.025.4

UNIFICATION OF DIESEL FUELS FOR HIGH-SPEED DIESELS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 11, 1979
signed to press 21 Sep 79 pp 8-10

MITUSOVA, T. N., AZEV, V. S., ENGLIN, B. A., and KUKUSHKIN, A. A.

[Abstract] Problems involved in reducing the assortment of domestic diesel fuels and unifying their quality indicators were discussed. It was argued that only 3 brands of diesel fuel instead of the presently used 8 brands could practically meet all of the existing needs in respect to diesel engines. It was proposed that the new standard for diesel fuel purity replace the indicators of water content, mechanical impurities and the naphthenic acids and filter-ability coefficient with the one indicator, namely the filter-ability coefficient closely correlated with operational properties of the fuel. References: 2.
[71-2791]

USSR UDC 621.892.097.2.025.4

UNIFICATION OF LUBRICANTS FOR AVIATION GAS TURBINE ENGINES

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 11, 1979
signed to press 21 Sep 79 pp 11-13

NOVOSARTOV, G. T., SMEYANOV, V. A., VILENKIN, A. V., and YECHIN, A. I.

[Abstract] The increase of the assortment of lubricants for aviation gas turbine engines (now numbering more than 20) was described and methods for their unification were discussed. The assortment recommended included: MS-8p and MS-8RK oils for turbojet engines with operating temperatures up to 150°C; IPM-10 oil for turbojet engines with operating temperatures up to 200°C, and MN-7.5u oil for turboprop engines, thus reducing the assortment from 20 to 4 oils.
[71-2791]

USSR UDC 621.892.097.2.025.4

UNIFICATION OF MOTOR OILS FOR SURFACE TECHNOLOGY

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 11, 1979 signed to press 21 Sep 79 pp 13-14

VIPPER, A. B., LASHKHI, V. L., and SHCHEGOLEV, N. V.

[Abstract] Problems involved in the unification of motor oils for use in automobile and tractor engines were discussed and characteristics required of prospective motor oil were described. The domestic, long-operating, All-Union oil DV-ASZp-10V was recommended as a general purpose oil for lubricating transmissions as well as engines. It can be used to replace more than 10 other brands of oil and provides savings of 40 rubles per ton of oil. The use of synthetic motor oils abroad was described briefly and some problems of production of domestic synthetic oils are listed. References: 4.
[71-2791]

USSR UDC 621.892.025.4

USE OF DV-ASZp-10V (M-6z/10V) OIL IN ENGINES OF DIFFERENT INTENSITY

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 11, 1979 signed to press 21 Sep 79 pp 14-17

LASHKHI, V. L., VIPPER, A. B., DNEPROV, V. N., and SHCHEROLEV, N. V.

[Abstract] Results of comparison of indicators of DV-ASZp-10V, M-10GF1, M-8GFz oils and others and their performance in the KamAZ-740 (KAMA Automobile Plant) engine and detailed laboratory studies of them were used to propose a generalized criterion of the detergent properties of the oils with additives. This criterion is proportional to the inclination of the oils to oxidation and inversely proportional to the dispersion and detergent properties of the oils evaluated on a model device. The formula for calculation is presented. The criterion was used during selection of DV-ASZp-10V oil for KAM AZ-740 and it also simplified selection of motor oils for engines of different intensity. References: 6.
[71-2791]

USSR UDC 665.637

PRODUCTION OF LOW-SULFUR BOILER FUELS FROM SULFUR AND HIGH-SULFUR PETROLEUMS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 11, 1979 signed to press 21 Sep 79 pp 27-29

RADCHENKO, YE. D., KAMINSKIY, E. F., KASATKIN, D. F., MITUSOVA, T. N., KORSHUNOVA, L. N., and GOLUBKOVA, G. D.

[Abstract] Three types of petroleum (Samotlorskaya, Romashkinskaya and Arlanskaya) were studied to determine the possibility of producing boiler fuels with sulfur content from 0.5 percent and higher by a procedure involving deep vacuum distillition of mazut with extraction of gas-oil up to 500 or 540°C--their hydrodesulphurization and removal of the hydrogenate above 350°C with crude tar oil. It was shown that with an increase of extraction of vacuum gas-oil, it is possible to reduce the sulfur content in the boiler fuel or to increase its yield. References: 2; Figure: 1.
[71-2791]

USSR UDC 665.642.4[477.8]

INTENSIFICATION OF OPERATION OF A SLOW-SPEEDING COKING DEVICE AT NADVORNYANSKIY PETROLEUM-PROCESSING PLANT

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 11, 1979 signed to press 21 Sep 79 pp 29-31

VALYAVIN, G. G., FRYAZINOV, V. V., YEZHOV, B. M., and VETOSHKIN, N. I.

[Abstract] Data of a comparative analysis of operation of two domestic devices of slow-speed coking with different lengths of runs between repairs were presented. Basic causes which limit the periods between repairs are the low agreggation stability of the raw material, the high share of distillate and the bulk gas content, the presence of crisis phenomena of heat exchange of the "second kind" the high duration of stay of the raw material in the reaction zone, the increase of hydraulic resistance in the transfer line and the linear speed of vapors in the reactors. Methods for increasing the periods between repairs and for improving the operation of the device as a whole were presented. References: 6; Figures: 2.
[71-2791]

USSR UDC 665.644.2.013.004.69.661.183.6

THE EXPERIENCE OF "YAROSLAVNEFTEORGSINTEZ" PRODUCTION UNION IN THE INTENSIFICATION AND MODERNIZATION OF THE LA/1M CATALYTIC CRACKING INSTALLATION

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 pp 3-5
manuscript received 1 Jun 78

RYBAKOV, P. N., MEL'MAN, A. Z., Yaroslavnefteorgsintez Union

[Abstract] The LA/1M catalytic cracking installation of the author's union was put in operation in 1967. For some time the installation operated unevenly with frequent shutdowns, high catalyst utilization and low end product yield, only 75% of the rated productivity. The operation of the system began improving in 1969 and continued to improve through 1977, reaching and exceeding the planned level of production and time between maintenance operations. In 1973, raw materials for furfural extraction began to be produced on the LA/1M installation. A diagram and explanation of the changes made to the installation to achieve these results are presented. It is now planned to convert the installation to a multistage-counterflow catalytic cracking installation by dividing the reactor with 3 plates, placing one of them in the present fluidized bed area of the regenerator, feeding in freshly regenerated catalyst at the top section of the reactor through a second transport line and replacing the existing cyclones with 5 groups of 2-stage cyclones. The redesign is expected to save over 1.5 million rubles per year. Figure 1. [59-6508]

USSR UDC 665.644.2.013.004.69.66-952.661.183.6

EXPERIENCE OF OPERATION OF THE LA/1M INSTALLATION FOR TWO-STAGE CRACKING WITH A ZEOLITE-CONTAINING CATALYST

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 pp 5-7
manuscript received 5 Sep 78

[Abstract] The two-stage catalytic cracking installation of the UNPZ refinery is currently undergoing radical modernization in a series of stages. The basic phases of modernization include: installation of a second cracking stage; replacement of existing condensors with air cooled condensors; replacement of nichrome-wire corona electrodes with needle-type corona electrodes; replacement of the aluminum silicate catalyst with milled zeolite-containing type ASHNTS catalysts, then type KMTS catalysts; and installation of new type TSN-15 cyclones. The capacity of the installation is to be increased by 40-60%, the end-product yield per unit volume by 15-20%. This will require, in addition to the above

changes, installation of a new reaction vessel for the first stage of cracking, improvement of the design of the second cracking stage, modernization of the cyclones and modernization of the catalyst transport system, an increase in the condensor surface of the main fractional installation column and raw material heat exchangers, installation of a heat recovery system and a slime settling tank, as well as replacement of existing pumps with more powerful pumps. Figure 1.
[59-6508]

USSR UDC 665.644.2.013.004.69.66-952

OPERATION OF THE TWO-STAGE 1A/1M CATALYTIC CRACKING UNIT AT THE NBNZ REFINERY IMENI VLADIMIR IL'ICH

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 pp 10-
manuscript received 12 Apr 78

RUSTAMOV, M. I., ALIYEV, V. S., PRYANIKOV, YE. I., ZEYNALOV, F. I., SHLYAKHOVSKIY, I. D., ABDULLAYEV, M. A., ALEKSANYAN, A. P., MKRTYCHEV, A. A., Institute of the Petrochemical Industry, AzSSR Academy of Sciences

[Abstract] Reconstruction of a 1A/1M type catalytic cracking installation (No. 32) for two-stage operation was completed in January of 1977. The raw material (vacuum distillate) is to be cracked in a reactor with ascending catalyst flow (stage I), and the cracking residue boiling over 195 C is to be crecked in a reactor with ascending catalyst flow (stage II), with combined output of the reaction products. The reactor is described, and tables present the results of experimental operation of the installation, qualitative characteristics of vacuum gas oil and residue and the material balance of the cracking process. The installation has been found to be quite flexible. Normal operation of the installation requires assurance of normal operation of the gas section, preventing the C_5 fraction from entering the dry gas, plus adjustment of the operation of the type 380-81-4 centrifugal gas pumps.
[59-6508]

USSR

UDC 665.644.2.013.002.1
66.012

EXPERIENCE OF OPERATION OF THE 1A/1M INSTALLATION AT "ANGARSKNEFTEORGSINTEZ" PRODUCTION UNION

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 pp 10-12
manuscript received 5 Sep 78

LEVIN, A. I., YERMAKOV, YE. A., ZARUBIN, V. M., Angarsknefteorgsintez Production Union

[Abstract] The 1A/1M installation of the author's enterprise was put in operation in 1967-1968. For some time, normal operation of the installation was not achieved basically due to unstable operation of the reactor section (frequent failures of catalyst circulation, high levels of coke formation, burning of carbon monoxide in the top zone of the regenerator, etc.). The reactor was significantly redesigned between 1968 and 1974. The following changes stabilized the operation of the reactor section: a type R-2 sprinkler line was installed between the inner and outer tubes of the vertical vessel; three pairs of cyclones in the regenerator were disconnected to increase the stack gas speed; unloading of catalyst from electric filter hoppers was directed into the fluidized bed of the regenerator; the installation was shifted to direct raw material feed; during maintenance cycles, cyclones, transport lines and the vessel are carefully inspected, particularly at the welded joints of the cyclones. The results of operation have confirmed the possibility of using non-superheated steam for catalyst transport, reactor stripping and in the stripping columns, and the possibility of using river water rather than chemically purified water to cool the stack gases.
[59-6508]

USSR

UDC 665.644.2
66.013.004.69
66.012.42.002.235

INCREASING THE POWER AND TRANSITION TO ZEOLITE-CONTAINING CATALYSTS IN THE CATALYTIC CRACKING UNITS OF GK-3 COMBINED INSTALLATION

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 pp 13-14
manuscript received 16 Nov 78

KHADZHIYEV, S. N., KRUGLOVA, T. F., SUMANOV, V. T., Groznyy Petroleum Scientific Research Institute, Grozgiproneftekhim

[Abstract] A plan has been developed to redesign the type GK-3 catalytic cracking installations to increase their capacity by 3%. The resulting increase in vacuum distillate allows the capacity of the catalytic

cracking unit to be increased. The redesign has required the solution of a number of specific problems related to the fact that the reactor is located coaxially beneath the regenerator. The basic changes suggested include: a decrease in the cracking zone in the fluidized bed by installation of vertical barriers in the circular reactor space; creation of additional hydrocarbon desorption zones for the catalysts; regeneration of catalyst in a multisection pseudocounterflow apparatus with the cold, coked catalyst fed into the top of the fluidized bed; assurance of good separation of the cracking products by installation of a circulating sprinkler at the top of the column and screen plates at the bottom of the column, improvement of the stabilization unit, including replacement of the S-shaped plates in the absorber with valve-type plates; and compression of cracking gases by the use of one primary and one reserve compressor. The material balance of the cracking process for vacuum distillate is presented. Figures 2.
[59-6508]

USSR

UDC 665.765
665.7.038.5
66.063.942
678.7

WEAR-PREVENTIVE EFFECT OF METAL-CONTAINING DETERGENT ADDITIVES TO OILS THICKENED WITH VINIPOL AND POLYISOBUTYLENE

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 p 29-30
manuscript received 18 Oct 78

KAYDALA, YE. V., GUREYEV, A. A., Moscow Institute of Petrochemical and Gas Industry imeni Gubkin

[Abstract] A study is made of the effectiveness of metal-containing detergent additives in oils thickened with polymers. The studies were performed using metal sulphonates, alkylphenylates and alkysalicylates as well as ash-free additives such as succinimide in low-viscosity type MK-8 oil thickened with polymers: type VB-2 vinipol (molecular mass 9000) and type P-3 polyisobutylene (molecular mass 8000). A four-ball friction was used for long-term testing of the lubricating qualities of the oils. The studies showed that the presence of the polymers in the oil does not change the behavior of the detergent additives. The differences in effectiveness determined were related to the composition and structure of the additives. References 2 Russian.
[59-6508]

USSR

UDC 665.637.73
665.663.4
66.404

EXPERIENCE OF PRODUCTION OF LIQUID PARAFFINS AT THE NOVOKUYBYSHEV REFINERY

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 pp 31-32
manuscript received 20 Nov 79

MILYUTKIN, V. S., TREMASOV, V. A., ISTAMGULOV, V. R., VAKHMYANIN, V. I., Kuybyshevnefteorgsintez Production Union

[Abstract] At the Novokuybyshev refinery, liquid paraffins are produced by carbamide deparaffinization of diesel fuels on type 64-1 and 64-2M installations. This article reports the variation in quality of liquid paraffin as a function of the fractional composition of the washing fractions used in the process, which has been on stream for a number of years. The content of aromatic hydrocarbons in the liquid paraffin is reduced by a factor of more than 2 by decreasing the end of boiling of the washing fraction from 192 to 170 C. This lightening of the washing fraction decreases the consumption of washing fraction in the process by a factor of 3-4.
[59-6508]

USSR

UDC 665.635
665.637.73
665.663.4
66-404

SEPARATION OF LIQUID PARAFFINS FROM DIESEL FRACTIONS OF A MIXTURE OF USINSKAYA AND PASHNINSKAYA PETROLEUMS BY CARBOMIDE DEPARAFFINIZATION

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 pp 32-33
manuscript received 5 Sep 78

OKHRIMENKO, N. V., MARTYNENKO, A. G., BAYBURSKAYA, E. I., Groznyy Petroleum Scientific Research Institute, Grozgiproneftekhim

[Abstract] Results are presented from a study of deparaffinization of the 180-320 C diesel fraction from a mixture of usinskaya and pashninskaya petroleums, taken in a ratio of 4:1, using crystalline carbomide on the G-64 installation. The conditions and results of deparaffinization of the diesel fraction are presented in a table. It is shown that diesel fuel which meets the requirements of State Standard GOST 4749-73 and liquid paraffin meeting the requirements of technical conditions TU 381015375 can be simultaneously produced by this process.
[59-6508]

USSR UDC 665.727.004.14

MEANS FOR UTILIZATION OF GASEOUS FUELS

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 pp 34-35
manuscript received 6 July 78

MATVEYEV, B. I., EPPEL', S. A., ARBATSKIY, V. A., Angarsknefteorgsintez Production Union, INUS

[Abstract] Modern oil refining and petrochemical processes consume large quantities of fuel, frequently more than the end products produced. A study is made of the effect that variation of process furnace parameters has on fuel consumption. It is found that combustion chamber temperatures should be reduced and airflow minimized by recirculation of stack gases in order to reduce the quantities of oxides of nitrogen emitted into the atmosphere while maintaining high efficiency.
[59-6508]

USSR UDC 541.183.547.313.6.661.183.6

SPECIFICS OF ADSORPTION SEPARATION OF 1-HEXENE FROM MIXTURES WITH n-HEXANE ON NaX ZEOLITE WITHOUT BINDER

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 pp 35-37
manuscript received 2 Aug 78

DOROGOCHINSKIY, A. Z., PROSKURIN, V. L., Groznyy Petroleum Institute

[Abstract] Results are presented from a study of certain process characteristics of the adsorption separation of 1-hexene from a mixture with n-hexane on NaX zeolite granulated without binders. The mixture of 1-hexane and n-hexane was passed through a nonmoving layer of the adsorbant at 0.2 hr^{-1}, with adsorption in the vapor phase at 373 K, air feed rate $48 \cdot 10^{-3}$ m^3/hr, time 4 hr. Preliminary experiments established that under these conditions of adsorption, 1-hexene broke through after 47 minutes, equilibrium was reached at 86 minutes. The results indicated that NaX zeolite without binder has high adsorption selectivity for olefin hydrocarbons and low catalytic activity (not over 3% of 1-hexene converted to isomers).
[59-6508]

USSR

UDC 661.7:547.422.23-31
(088.8)

NEW PROCESSES OF SYNTHESIS OF PROPYLENE OXIDE USED ABROAD

Moscow NEFTEPERERABOTKA I NEFTEKHIMIYA in Russian No 7, 1979 pp 37-39
manuscript received 16 Nov 78

KAYUMOV, R. P., KHAIMOVA, T. G., Central Scientific Research Institute for Heat Engineering and Petrochemistry

[Abstract] The development of the production of propylene oxide in the USA and other western countries (West Germany, Britain, Japan) is briefly reviewed. Methods used, yields achieved and the applicable patents are mentioned. References 5: 1 Russian, 4 Western.
[59-6508]

USSR

UDC 553.983:543.8

HYDROCARBONS AND OXYGEN COMPOUNDS IN THE BITUMENS OF KUKERSITE OIL SHALES

Tallin IZVESTIAY AKADEMII NAUK ESTONSKOY SSR - KHIMIYA in Russian Vol 28 No 3, 1979 pp 182-190 manuscript received 27 Oct 78

PAIS, Ruth, KLESMENT, I., POBUL, Linda, Institute of Chemistry, Estonian Academy of Sciences

[Abstract] This is a continuation of an earlier work which described commercial batches of kukersite in terms of oxidative kerogen destruction. The low concentration of bitumen in the kerogen and its group composition indicate that this bitumen is syngenetic. The authors studied the way in which the bitumen and kerogen are structurally connected. They also analyzed four commercial batches of kukersite and asphaltite, the organic-rich dark-colored layer found in the middle of the kukersite strata. Whereas American studies of Colorado shales containing 10-20% bitumen from organic matter have indicated, based on the identical structures of the bitumen and kerogen that there is a genetic relationship between them, the present study rarely found such structural elements in the bitumen and kerogen. The kukersite contained little bitumen--0.7% of the total organic matter. The authors believed that the different composition of the bitumen and kerogen does not prove that they are epigenetic. Kukersite also fails to follow the rule that the paraffins of ancient shales have KH~1 and carbon chains shorter than C_{22}. Figures 5, References 12: 8 Russian, 4 Western.
[60-6508]

USSR UDC 662.67+552.57

STUDY OF THE ORGANIC MATTER OF FUEL SHALE OF THE MANDRA DEPOSIT BY LOW-TEMPERATURE DESTRUCTIVE HYDROGENIZATION

Tallin IZVESTIYA AKADEMII NAUK ESTONSKOY SSR - KHIMIYA in Russian Vol 28 No 3, 1979 pp 191-197 manuscript received 26 Oct 78

NAPPA, Lia, KLESMENT, I., VINK, N., KAYLAS, K.

[Abstract] Destructive hydrogenization was used to study the organic matter of Bulgarian fuel shale from the Mandra deposit. Ground shale was treated with 10% hydrochloric acid and extracted with chloroform to determine its material composition. Hydrogenization was performed in a rocking autoclave for 6 hours, with ammonium molybdite applied to the ground shale as a catalyst. Hydrogenization was performed at 330, 360, 390 and 420°C, initial hydrogen pressure 50 atm. Hydrogenization was also performed with the temperature and pressure increasing at three levels from 360°C/25 atm to 290°C/50 atm. It was found that it was much more difficult to hydrogenate this shale than the estonian kukersite shale. The most characteristic structural elements of the kerogen of this shale are long unbranched carbon chains with 10 to 37 carbon atoms. The terrigenous material present in the process of formation of the shale is considered important in determining the properties of the shale. The results indicate that the organic matter of the shale did not experience deep transformation in diagenesis, so that the initial structures of the biologic matter have been retained. Figures 3, References 5: 3 Russian, 2 Western. [60-6508]

USSR

CONTRIBUTION OF VNIINEFTEKHIM TO THE DEVELOPMENT OF PROCESSES OF PRODUCING COMPONENTS OF HEAVY DIESEL FUEL AND AROMATIC HYDROCARBONS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 3-5

SHILIKIN, V. V.

[Abstract] A summary is given of achievements of VNIINeftekhim [All-Union Scientific Research Institute of Petrochemical Processes] in the area of the production of high-octane components of heavy diesel fuels and aromatic hydrocarbons since its founding in 1929. In the 1950's were created domestic modifications of the catalytic reforming of gasoline fractions and catalysts were created for this process. Catalytic reforming is one of the most important processes in oil refining and in the production of high-octane gasolines. This process is also of great importance in the production of aromatic hydrocarbons, such as benzene, toluene and sylene.

More than half of all the benzene produced in the country is produced in catalytic reforming plants, and more than 90 percent of the toluene and xylene. At the present time in the USSR there are in operation more than 80 plants with an output of from 300,000 to one million tons per year. In 1967 the institute developed a new variant of catalytic reforming for the production of gasoline with an octane number of 95. The AP-64 alumino-platinic catalyst promoted with chlorine was developed for this process. The employment of a chlorinated catalyst required the development of a new technology making it possible to maintain the required chlorine content in the catalyst. In order to improve the catalytic reforming process new more stable catalysts were created, in particular, the bimetallic and polymetallic KR series. The yield of gasoline with an octane number of 95 with these catalysts is five to seven percent greater than with the AP-64 catalyst. The yield of aromatic hydrocarbons is 15 to 20 percent greater with these catalysts. At the present time more than 20 percent of catalytic reforming plants are operating with KR series catalysts. The institute has developed processes for producing high-octane iso-paraffinous fuel components, including the isomerization of normal paraffins and selective hydrocracking. In the 1960's a domestic process was developed for the high-temperature isomerization of n-pentane and top gasoline fractions. This process also makes it possible to produce isopentane, the raw material for producing isoprene. The high-temperature isomerization process developed by the institute has competed successfully in the world market. Developed at the institute in recent years is a process for the low-temperature isomerization of paraffins. The advantage of this process is that it takes place under conditions thermodynamically more favorable for the isomerization of alkanes than is high-temperature isomerization. The process utilizes an NIP-74 catalyst at a temperature of 130 to 150°C. At the current time the institute is developing a process for the liquid-phase isomerization of alkanes at 30 to 50°C with superacidic catalysts. This represents a major step forward in the production of high-octane gasolines. Selective hydrocracking has been tested in a commercial plant with a raw material capacity of 100,000 tons per year. This process makes it possible to increase the octane number of reforming process gasolines and to increase their yield. The system developed by the institute makes it possible to produce high-octane motor vehicle gasolines without using an expensive alkylate. The institute is the leading organization in the country in the production of monocyclic aromatic hydrocarbons, including benzene and xylene. The institute has developed a new process for the dealkylation of toluene: by conversion with water vapor, for which no hydrogen at all is required. This process is expensive, however, and the need to improve it has been recognized, in particular, by using as the raw material fractions of highly aromatized reforming gasolines in which paraffins are contained in addition to aromatic hydrocarbons, which are converted with the formation of hydrogen in the process. Another process developed by the institute in recent years, for producing benzene and xylene, includes the reactions of hydrodealkylation, transalkylation and disproportionation of aromatic hydrocarbons, as well as hydrocracking of non-aromatic hydrocarbons. Aromatic hydrocarbons containing at least two carbon atoms in

the side chains, such as ethyl and propyl benzene, are preferentially subjected to hydrodealkylation. As a result, in the xylenes formed ethyl benzene is not contained, which facilitates their separation and isomerization. All the aromatic hydrocarbons contained in the reforming catalysis product are converted into the most valuable products, i.e., benzene and xylene. With the industrial implementation of this process it will be possible to dispense with the separate reforming of narrow- and wide-boiling-range reactions and combine the production of high-octane gasoline and aromatic hydrocarbons in catalytic reforming plants of the same type with a higher capacity. The accomplishments enumerated indicate the great importance of the institute to the industry.
[40-8831]

USSR UDC 665.642.5

CATALYTIC REFORMING OF GASOLINE FRACTIONS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 5-14

MASLYANSKIY, G. N., ZHARKOV, B. B., FEDOROV, A. P. and SHAPIRO, R. N.

[Abstract] About 80 percent of the total capacity of USSR catalytic reforming plants is employed to produce motor vehicle gasoline of different types, and this process is very important in the production of aromatic hydrocarbons. Catalytic reforming is used to produce about 60 percent of the benzene and 90 percent of the toluene and xylene in the country. A history is given of the development and improvement of platinum reforming catalysts. Used first were platinum catalysts of the AP-56 type, in which fluorinated aluminum oxide was used as a support. Later were used aluminoplatinic catalysts of the AP-64 type, promoted with chlorine. These catalysts made it possible to increase the octane number of reforming gasoline to 96, because of their better activity and selectivity. The state of the art of the development of the process has involved the development and introduction of highly stable polymetallic catalysts of the KR series. Because their rate of deactivation under the process's conditions is slower that that of monometallic aluminoplatinic catalysts, it has been possible to raise the octane number of reforming gasoline considerably. A higher yield of gasoline and aromatic hydrocarbons is also made possible. The requirements are discussed for the purity of the support. The support employed for platinum catalysts is aluminum oxide of the required physicochemical properties, i.e., the gamma and eta modifications. In the Soviet Union, for this purpose is used a gamma oxide of aluminum obtained by precipitating sodium aluminate with nitric acid. The aluminum oxide contains various impurities such as oxides of iron and sodium, which considerably worsen the quality of the catalyst. With a too high content of iron impurities in the aluminum oxide, the degree of aromatization of the benzine fraction in the reforming process is reduced. Iron suppresses

one of the most important functions of platinum, i.e., the dehydrogenation of naphthenic hydrocarbons. The contamination of aluminum oxide with sodium results in lowering of its acidity and a resulting reduction in the catalyst's activity. The aluminum oxide support must thus be of high purity. The catalytic properties of the reforming catalyst are improved by even distribution of the platinum in granules of the catalyst. This is made possible by the addition to the H_2PCl_6 solution of another acid, such as acetic acid. The content of platinum in the catalyst influences the rate of the various reactions of hydrocarbons in reforming and also the stability of the catalyst. A platinum content of 0.3 to 0.6 percent by weight in reforming catalysts is sufficient. The influence of the acid promoter is discussed, and it is concluded that it is better to use chlorine as the acid promoter, rather than fluorine. In order to reduce the cracking activity of platinum catalysts in the initial period of operation, which reduces the concentration of hydrogen in the circulating gas and causes the partial coking of catalysts during startup, catalysts are sulfurated by different methods. The size of the catalyst's granules influences the process. The yield of reforming gasoline can be increased substantially by reducing the size of catalyst granules to 1.5 mm. Polymetallic catalysts have been shown to be far superior in terms of stability to the AP-64 catalyst. Various ways of improving the technology are discussed. A system has been proposed for the combined production of aromatic hydrocarbons and a high-octane component of motor vehicle gasoline. This has been made possible with the LCh-35-11/1000 unit, using a polymetallic catalyst. Sulfur containing compounds must be carefully cleaned from the raw material for the successful functioning of platinum reforming catalysts. Hydrodesulfurization units have been provided for this purpose. The unit power of plants has been increased. Since 1970 plants with a capacity of one million tons per year have been in operation, both in the form of self-contained units of the L-35-11/1000 type, and of blocks of combined units of the LK-6u type. The employment of polymetallic catalysts is discussed in terms of the influence of the fraction and hydrocarbon composition of the raw material, the influence of pressure, the production of high-octane gasoline in industrial plants, and the production of aromatic hydrocarbons. Data are given on the catalytic reforming of wide-boiling-range gasoline fractions at low pressure, with the KR-106 catalyst at a pressure of 1.5 MPa and a sulfur content in the raw material after hydrodesulfurization of less than 1 mg/kg. Also are given performance figures for the LCh-35-11/600 plant when employing the KR-104 catalyst, and for the LG-35-8/300 plant when employing AP-64 and KR-104 catalysts. By replacing catalyst AP-64 with catalysts KR-102 and KR-104 and reducing the operating pressure from 1.8 to 2 to 1.4 to 1.6 MPa, the total yield of benzene and toluene increased by 12 to 15 percent. Figures 5; references 27 Russian. [40-8831]

USSR UDC 665.654.2:62-631.2

SELECTIVE HYDROCRACKING OF GASOLINE FRACTIONS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 14-17

GEORGIYEVSKIY, V. YU., MASLYANSKIY, G. N., ROZENBLIT, A. B. and SHIPIKIN, V. V.

[Abstract] The selective hydrocracking of gasoline fractions consists in the selective splitting of low-octane normal paraffins and is employed for the purpose of improving the antiknock value of gasolines. Selective hydrocracking is similar to the selectoforming process developed in the USA for raising the octane number of reforming catalysis products. The process of the selective hydrocracking of refining products has successfully passed tests in an industrial plant with a raw material capacity of 100,000 tons per year. The selective hydrocracking of normal paraffins mixed with isoparaffins and cyclic hydrocarbons is performed with bifunctional catalysts based on so-called geometrically selective zeolites. The inlet windows of these zeolites allow molecules of normal paraffins to pass freely into the inside space and react there, whereas molecules of isoparaffins and cyclic hydrocarbons are not admitted. This explains their selectivity. The results are given of a study of the selective hydrocracking of refining products with the SG-1 catalyst, which was used for an experimental industrial test of the presess. Hydrogen was used to pressurize the plant, with recirculating hydrogen containing gas. The liquid and gaseous reaction products were analyzed chromatographically. The activity of catalysts was evaluated from the degree of hydrocracking of normal paraffins. Selectivity was determined by the equation $S = K_n \cdot 100/(K_n+K_i+K_{ts})$, where K_n, K_i and K_{ts} are the number of normal paraffins, isoparaffins and cyclic hydrocarbons subjected to hydrocracking, in percentage by weight. Used as the raw material was a gasoline refining product obtained after the extraction of aromatic hydrocarbons from the reforming catalysis product of the 62 to 105°C fraction in an LG-35-8/300 plant, as well as the fraction of a rigid-condition reforming catalysis product which boils away before 100°C. Discussed individually are the influence of the catalyst, the influence of the bulk feeding rate for the raw material and of the temperature, the influence of pressure, and the influence of the number of times the hydrogen containing gas circulates. The activity of catalysts in the reaction for the hydrocracking of normal paraffins depends not only on their composition but also on the method of preparation. By varying the method of preparing the catalyst it is possible to regulate its activity in the hydrocracking of normal paraffins with chains of different length. It is demonstrated that the selectivity of the process is a function only of the intensity of the hydrocracking of normal paraffins and does not depend on the temperature and bulk rate of feeding of the raw material. In the studies conducted the

depth of conversion of normal paraffins was reduced in proportion to an increase in pressure over the entire range of bulk rates of feeding of the raw material. This is a result which contradicts previous studies and the patterns of normal non-selective catalytic hydrocracking, and requires special study. Selective hydrocracking can be carried out at a pressure of 2 to 4 MPa, making it possible to use existing equipment, in particular, existing catalytic reforming plants. Changing the multiplicity factor for the circulation of gas from 500 to 1500 liters per liter of raw material has practically no effect on the composition and yield of products of the selective hydrocracking of a refined product. In the selective hydrocracking of a gasoline refining product, it is possible to produce the isoparaffin component of a motor vehicle gasoline with an octane number of 76. The yield of useful products, including the high octane-component and the liquid gas, is approximately 96 percent by weight. Figures 3; references 11: 7 Russian, 4 Western.
[40-8831]

USSR UDC 665.656

CATALYTIC PROCESSES FOR THE CONVERSION OF PARAFFINS AND AROMATIC HYDROCARBONS

Moscow KHIMIYA I TAKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 18-24

BURSIAN, N. R., VOLNUKHINA, N. K., KOGAN, S. B. and SHAVANDIN, YU. A.

[Abstract] Paraffins C_4-C_6 and C_{11}-C_{18} contained in petroleum have been involved in different oil refining and petrochemical processes developed at VNIINeftekhim [All-Union Scientific Research Institute of Petrochemical Processes]. These hydrocarbons make up approximately seven percent of the content of different oils in the USSR, representing a potential refining volume of about 30 million tons. The dual conversion of C_8 aromatic hydrocarbons and the transalkylation of toluene and aromatic C_9 have been studied at the institute and brought to the industrial planning stage. An experimental verification has been made of the processes of low-temperature isomerization and dehydrogenation of paraffins at the Krasnodar branch of the institute. Discussed individually and in detail are the isomerization of paraffins C_4-C_6, the catalytic dehydrogenation of higher paraffins, and the isomerization, disproportionation and transalkylation of aromatic hydrocarbons. The process of the isomerization of paraffins developed in the Soviet Union because of the demand for isobutane, isopentane and high-octane float components of AI-93 motor vehicle gasoline. The process of isomerization is carried out at the present time at five industrial plants with a 53 to 55 percent yield of isopentane for admitted n-pentane and 96 percent by weight for converted n-pentane and an IP-62 catalyst life of

as long as six years. The development of the NIP-74 catalyst made possible a variant of the low-temperature isomerization process which can be carried out at 120 to 200°C with a hydrogen pressure of 3 to 4 MPa. A determination is made of the optimal conditions for the chlorination of the NIP-74 catalyst and of its chemical composition, which equals 0.6 percent by weight of platinum and eight to 10 percent by weight of chlorine. Conditions have been found for the chlorination of the NIP-74 catalyst which make possible minimum heating of the catalyst bed and high isomerizing activity with the minimum formation of gaseous chlorination products. The optimal parameters for the process of the isomerization of n-pentane, n-butane, n-hexane and a pentane-hexane fraction are a temperature, depending on the molecular weight of the paraffin, of 120 to 200°C, a pressure of 3 to 4 MPa, a bulk rate for feeding the raw material of 2 h^{-1}, and a molar ratio of hydrogen to raw material of two. Under these conditions the depth of conversion of normal paraffins in percentage by weight is 50 for n-butane, 75 for n-pentane and 87 for n-hexane. These figures are approximately 1.5-fold higher than those for the high-temperature isomerization using the IP-62 catalyst. In plants for the low-temperature isomerization process, units have been provided for cleaning from the raw material and hydrogen containing gas impurities of sulfur, nitrogen and oxygen containing compounds. Of great interest is the utilization of isomerization products mixed with methyl-tert-butyl ether (MTBE) in preparing non-ethylated gasolines. A gasoline of the AI-93 type can be prepared by mixing reforming gasoline with an octane number of 95 and the isomerization product of a pentane-hexane fraction with an octane number of 83 in a ratio of 1:1 with the addition of five percent by volume of MTBE with an octane number of 115 to 135. By this method it is possible to produce a motor vehicle gasoline with 36 percent by volume of aromatic hydrocarbons. An analysis demonstrates that the most promising process, and one that has important technological and economic advantages, is that of low-temperature isomerization employing an aluminoplatinic catalyst promoted with chlorine. This is the variant which has become widespread abroad and has been approved for commercial introduction in the Soviet Union. The requirements have been formulated for the chemical composition of the catalyst and the structure of the support, as well as the fundamental principles for accomplishing the process, for the catalytic dehydrogenation of higher paraffins. Development of the process of dehydrogenation of C_{11}-C_{18} paraffins into the respective linear olefins has been related to the problem of utilizing these olefins for the synthesis of biodegradable surface-active substances. Data on the process of the dehydrogenation of higher paraffins are given in a table. A process possessing high selectivity has been created. Thermodynamic features of the dehydrogenation reaction restrict the working pressure to 0.2 to 0.3 MPa and the temperature range to 250 to 500°C. The dehydrogenation reaction is accompanied by the side reactions of isomerization, aromatization and cracking. Selectivity was made possible by the proper selection of the chemical composition of the catalyst and by carrying out the process

with a short contacting period. Two modes of the process have been developed, one making possible a paraffin conversion depth of about 10 percent, and another a raw material conversion of 16 to 17 percent. Increased conversion results in lower selectivity, necessitating higher stability for the catalyst. The increase in conversion to 16 to 17 percent has resulted in an annual savings of about 900,000 rubles per year. Processes for the isomerization of xylenes, the disporportionation of toluene and the transalkylation of aromatic hydrocarbons have been developed because of the demand for benzene and p- and o-xylene, and of the predominance in the products of catalytic reforming of toluene and m-xylene. For the isomerization of xylenes a platinum catalyst is used and the plant is pressurized with hydrogen. The raw material used contains 20 to 22 percent ethyl benzene in addition to xylenes. Catalysts of different acidity are required for the isomerization, disproportionation and transalkylation reactions, and this acidity is regulated by the amount and chemical composition of the mordenite. Figures 1; references 17: 16 Russian, 1 Western.
[40-8831]

USSR UDC 665.644:661.715.7

PRODUCTION OF BENZENE AND XYLENES IN THE 'DEALFORMING' PROCESS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 23-26

RABINOVICH, G. L., MASLYANSKIY, G. N., SELEZNEV, V. D. and GOKHMAN, B. KH.

[Abstract] At VNIINeftekhim [All-Union Scientific Research Institute of Petrochemical Processes] a new process has been developed for producing benzene and xylenes, called "dealforming." The raw material used is catalysis products of the reforming of wide-boiling-range gasoline fractions (60 to 140, 60 to 180 and 85 to 160°C) containing not less than 60 percent aromatic hydrocarbons. Taking place in the process are the reactions of hydrodealkylation, disproportionation, transalkylation of aromatic hydrocarbons, and the hydrocracking of non-aromatic hydrocarbons. Aromatic hydrocarbons containing at least two carbon atoms in the side chains, such as ethyl benzene and ethyl toluene, are hydrodealkylated. The xylenes formed contain almost no benzene, facilitating their subsequent separation and isomerization. The disproportionation and transalkylation of aromatic hydrocarbons take place when the process occurs with the recirculation of toluene or toluene and aromatic hydrocarbons C_9-C_{10}. Paraffins of both a normal and iso- structure present

in the raw material are hydrocracked. In the process takes place the practically total splitting of paraffins C_8-C_{10}, forming azeotropic mixtures with toluene and xylenes. The hydrocracking of paraffins results in the formation chiefly of ethane, propane and butane, whose total yield is eight- to 10-fold greater than that of methane. Reactions take place, each of which is usually carried out as a separate process. A block diagram is shown of the "dealforming" plant. The float fraction, up to 105°C, is skimmed from the reforming catalysis product. This fraction consists mainly of non-aromatic hydrocarbons and benzene in the reforming catalysis product, a 105°C fraction consisting of aromatic hydrocarbons C_7-C_{10} and five to 15 percent paraffins. This heavy fraction serves as the raw material for the "dealforming" process. The usual hydrogenation method is used, with the recirculation of a hydrogen containing gas. The heavy fraction and the hydrogen containing gas pass through a reactor with a special catalyst pressurized at 2 to 4 MPa at a temperature of 520°C. The benzene fraction is skimmed from the liquid reaction product and, mixed with the head fraction of the reforming catalysis product, is delivered for extraction. Pure combined xylenes are separated by ordinary rectification. Toluene or toluene with unconverted aromatic hydrocarbons C_9-C_{10} are returned to the process, mixed with the original raw material. A description is given of variants of the process which include the recirculation of different hydrocarbon fractions for the purpose of producing different aromatic hydrocarbons. Three variants are described, consisting of the single-operation variant, recirculation of the toluene fraction, and recirculation of the toluene fraction and aromatic hydrocarbons C_9. The results are given of experiments using these three variants. The products of the first variant are benzene, toluene and xylenes. The second variant makes it possible to increase considerably the yield of benzene and xylenes. The maximum yield of xylenes is achieved by the third variant. In the first variant the yield of benzene is twofold greater and that of toluene 1.25-fold greater as compared with the content of these hydrocarbons in the starting reforming product. In the second variant the yield of benzene is 3.7-fold and of xylene 1.35-fold higher than the content in the starting raw material. In the third variant the yield of benzene is 3.5-fold and of xylene 1.7- to 1.8-fold greater. With combined catalytic reforming and "dealforming," in refining one million tons of the 70 to 180°C fraction of West Siberian oil it is possible to produce about 155,000 tons of benzen and 300,000 to 350,000 tons of xylenes. The purity of combined xylenes from the "dealforming" process extracted by rectification is greater than 99.5 percent. The combined xylenes are made up of 0.5 to two percent by weight of ethyl benzene, 20 to 22 of n-xylene, 48 to 51 of m-xylene and 25 to 28 of o-xylene. Because of the extremely low ethyl benzene content, the content of n- and o-xylene is 10 to 20 percent greater than in combined xylenes from the reforming process. Toluene can be extracted from the "dealforming" products by ordinary rectification, with a purity of 99 to 99.5 percent. Figures 2; references 2 Russian. [40-8831]

USSR UDC 661.715.7:665.662.3

SEPARATION OF AROMATIC HYDROCARBONS

Moscow KHIMIYA I TAKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979
pp 26-29

GRISHCHENKO, N. F., YABLOCHKINA, M. N., SHAPIRO, L. P. and ROGOZKIN, V. A.

[Abstract] Individual aromatic hydrocarbons of greater purity are required for the production of synthetic fibers, plastics and rubber products. The catalytic reforming of gasoline fractions is the main source of aromatic hydrocarbons. Aromatic hydrocarbons are extracted from catalysis products of reforming and other aromatized raw material by means of liquid extraction with selective solvents, the most widespread of which are polyglycols. A table is shown of the physicochemical properties of anhydrous polyglycols used as extracting agents. Research conducted in the USSR has made it possible to develop an optimal system of extraction making it possible to produce benzene, toluene and xylenes economically and with high efficiency. The raw material used for catalytic reforming consists of narrow-boiling-range gasoline fractions at 62 to 85, 62 to 105 and 105 to 140°C. Processing of the first fraction makes it possible to produce benzene, the second, benzene and toluene, and the third, toluene and xylenes. The addition of reforming-extraction units has made it possible to produce aromatic hydrocarbons suitable for any specialized application. At the current time the output of benzene with extraction plants is about 60 percent of the total output, of toluene more than 80 percent and of xylene more than 50 percent. The growing demand for aromatic hydrocarbons has resulted in the necessity of creating larger-capacity plants. For the purpose of increasing the efficiency of extraction plants it has been necessary to convert to higher-molecular glycols, such as tri- and tetraethylene glycols, in place of diethylene glycol. The effectiveness of tetraethylene glycol is twofold greater than that of diethylene glycol. Research data on phase equilibria form the basis for developing a technology for the process of extracting aromatic hydrocarbons with polyglycols. The key technological indicators are given for the processes of extraction with hydrous polyglycols, as well as data on the extraction of aromatic hydrocarbons from reforming catalysis products. At the current time the process utilizing triethylene glycol has been put into service at nine existing plants. Preparations are under way for converting an existing plant to tetraethylene glycol. For new higher-capacity plants, in addition to extraction with tetraethylene glycol, a process has been developed for extraction with a hybrid solvent based on propylene carbonate. This is called the "Ekstars" process. This process features skimming of the extract without supplying water vapor, washing the solvent off of extraction products by using an anhydrous solvent, and skimming off the recirculation product without supplying

a reflux. The key indicators are shown for the processes of extraction with polyglycols and a hybrid solvent based on propylene carbonate, as compared with Sulfolane. At the present time tetraethylene glycol is best in terms of being able to make the solvent in the necessary amounts and in the time available. Plans have been made for enlarged plants for extracting aromatic hydrocarbons with polyglycols, for the combined production of benzene, toluene and xylenes. The 62 to 140°C fraction of the reforming catalysis product will act as the raw material. The degree of purity of aromatic hydrocarbons is rated on the basis of their content of unsaturated compounds. The raw material for extraction usually contains as much as two percent of these compounds and in the extraction process the main share of these compounds is concentrated in the refining product and as much as 0.1 percent is transferred to the aromatic extract. When the extract is rectified traces of unsaturated compounds end up in the aromatic hydrocarbons and lower their quality. For eliminating the presence of unsaturated compounds, VNIINeftekhim [All-Union Scientific Research Institute of Petrochemical Processes] has developed a process for the selective hydrogenation of reforming catalysis products, and this process is carried out in an additional reactor included in the catalytic reforming system, at 160 to 250°C with an aluminoplatinic catalyst in a combined steam and gas mixture flow at a pressure of 1.5 to 3.5 MPa. The catalyst used for selective hydrogenation contains 0.1 to 0.15 percent platinum applied to unfluorinated aluminum oxide. This process has been introduced at all catalytic reforming plants producing aromatic hydrocarbons. Aromatic hydrocarbons of high quality are produced without the need for additional purification. The need for cleaning sulfur containing compounds from the starting raw material is stressed. The need for a new catalyst is stressed, distinguished by high selectivity and stability in the processing of low-sulfur raw material and ensuring the hydrogenation depth required to produce individual aromatic hydrocarbons and hydrocarbon solvents suitable for modern needs.
References 6 Russian.
[40-8831]

USSR UDC 662.753.11/13

PRODUCTION OF LIQUID FUEL FROM SOLID WASTE

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 29-32

GLEZIN, I. L., PETROV, V. N., TIMOFEYEV, G. A. and BEZMOZGIN, E. S.

[Abstract] An account is given of experiments in and of worldwide know-how gained in the utilization of waste from the production of manmade materials as a source for producing manmade liquid fuel. Treated in particular is the pyrolysis of worn motor vehicle tires to produce liquid products in

the form of resins to be used as furnace fuel oil. The results are given of studies conducted at VNIINeftekhim [All-Union Scientific Research Institute of Petrochemical Processes] on resins produced from the pyrolysis of worn tires, waste from polystyrene production and domestic waste, for the purpose of determining whether the resulting resins meet the standard specifications for liquid fuels. The waste materials were cleaned to remove coarse inorganic inclusions such as pieces of metal and rock and contained in addition to rubber also cloth, wood, paper and other components. The waste material was heated to the required temperature without admitting air and was held isothermically at this temperature until the cessation of gas liberation. The tires and domestic waste were heat treated at 500°C, and the polystyrene waste at 400 to 450°C. The results obtained show that the resins produced from the heat treatment of different waste materials differ considerably both in terms of yield and key physicochemical indicators. The resin from the pyrolysis of polystyrene waste is a purely hydrocarbon product with an empirical formula of $C_{7.66}H_{7.78}$. In the resin produced from worn tires are contained hetero-elements with a sulfur content of about 0.7 percent. The resin from the pyrolysis of domestic waste has a low sulfur content and a very high oxygen content. All the resins produced have a high content of float and medium-weight fractions. They also have a very low flash point, and therefore they do not satisfy the specifications for furnace fuel oil. The resin from the pyrolysis of worn tires can be categorized as a low-sulfur fuel, but its heavy fraction is somewhat inferior in sulfur content to standard petroleum fuel. Not more than 60 percent of the resin derived from tire rubber and about 70 percent of the resin from domestic waste can be used as furnace fuel oil, since only the heavy fractions of these resins meet the GOST [All-Union State Standard] specifications. The use of heavy fractions alone complicates the process for preparing and utilizing the resins, since they must be fractionated and processed separately into low-boiling-point fractions. It has therefore been proposed that the complete resins be used without preliminary fractionation as an addition to petroleum waste or manmade liquid fuel. The idea is to create from oils and resins not meeting the requirements fuel composites which make maximum use of the best qualities of their components. A brief account is given of the FRG's experience in the joint heat treatment of solid fuel and waste to produce composites of this type. In the USSR studies have shown that the resin yield can be increased by heat treating a mixture of shale with rubber waste products. By semicoking mixtures of shale with a combustion heat of 10.5 and 8 MJ/kg containing 10 and 25 percent rubber, respectively, it is possible to achieve the same resin yield as from high-quality shale with a combustion haat of 13.4 MJ/kg. Tests made at VNIINeftekhim and the "Slantsy" [Shale] Plant have demonstraced the feasibility of combined heat treatment of shale and rubber waste in a commercial producer furnace. Crushed worn tires are well suited for this process, inasmuch as it is necessary to use waste with a bulk density of 600 to 700 kg/m^3 in pieces measuring not greater than 100 mm. It is suggested that worn tires be gathered and processed

centrally. The savings resulting from the erection of a special plant for the pyrolysis of worn tires will pay back the cost of transporting them. References 9: 6 Russian, 3 Western.
[40-8831]

USSR UDC 62-634.2.003,4,5

CHEMOMOTOLOGICAL SOLUTIONS TO THE PROBLEM OF FUEL RESOURCES

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 35-38

PISKUNOV, V. A., CHERNOVA, K. S., MIKHEICHEV, P. A., YURUKOVSKIY, N. P. and ZRELOV, V. N.

[Abstract] A study is made of the feasibility of lowering the requirements for the quality of aircraft fuels for the purpose of making broader use of their resources. It is demonstrated that it is necessary to disclose the interrelationship between the properties of fuels, the quality of aircraft equipment and the conditions for its employment, i.e., to carry out extensive chemomotological research. The special science of chemomotology, concerned with the theory and practice of the efficient utilization of fuel, make it possible to expand fuel resources for jet aviation by altering the structure of the balance of petroleum products produced from a unit volume of crude. It is impossible to increase the yield of aviation kerosene from crude without some worsening of the kerosene's quality; it is therefore necessary to increase the degree of adaptability of aircraft equipment to fuels of reduced quality. To expand the potential content of jet fuel fractions, a thorough analysis is required of the extent of the change in yield and quality of other motor fuels. The problems which arise in expanding the resources of jet fuels by altering the structure of the yield of petroleum products can be solved by raising the cloud point of fuels and the content of aromatic hydrocarbons in them. It is shown that it is possible to increase the yield of jet fuel from crude at the expense of reducing the fuel's quality and the yield of other petroleum products. The results are given of tests made by English firms for the purpose of determining the feasibility of the large-scale employment of fuel with an elevated cloud point. These tests established the actual temperatures of the fuel in the tanks of aircraft during long flights on major air routes and made a precise determination of fuel indicators which most precisely determine the efficiency of the fuel system and engine at below-zero temperatures. It was demonstrated that for the purpose of improving the safety of flights utilizing equipment with inadequate chemomotological reliability is is necessary to modify the conditions for the operation of this equipment. For example, for a Boeing 747 equipped with a fuel filter heat shield system it is recommended that flight conditions be

changed with respect to speed and altitude when the temperature of the fuel in the tanks is 3°C above the cloud point. When using fuel with a cloud point of -40°C, for a safe flight the M number must equal 0.84 if the predicted temperature of the outside air at the flight altitude along the route is from -62 to -66°C. When the temperature of the outside air is from -66 to -70°C it is suggested that a flight altitude be chosen which has a higher outside air temperature, without changing the M number. It has also been demonstrated that the fuel's cloud point does not completely characterize the behavior of the fuel in aircraft systems at low temperatures. Cavitation operating modes of booster pumps begin at fuel temperatures below the cloud point. A description is given of a method and instrument developed by Shell Oil for measuring the "cold flowability" of fuel. The permissible temperature for the safe employment of cooled fuel with an elevated cloud point is that at which the cavitation mode of pumps begins because of clouding of the fuel after 70 percent of its volume has been pumped. The instrument employed to test the suitability of fuel consists of two chambers separated by a valve. The fuel to be tested is poured into the top chamber and the instrument is immersed in a vat with a coolant. At a certain temperature the valve opens and the unclouded fuel flows from the top chamber into the bottom. The suitability of the fuel is determined from the amount of fuel left. By this method an estimate was made of the influence of paraffins on the low-temperature properties of Jet A-1 fuel, and it was shown that with an increase in the content of these hydrocarbons the range of application of this fuel is narrowed considerably. An increase in the content of aromatic hydrocarbons in the fuel involved the danger of overheating of the walls of fire tubes under the influence of heat from the flame. Tests have shown that with an increase in the content of aromatic hydrocarbons in Jet A-1 fuel from 20 to 22 percent by volume the temperature of a fire tube's wall is raised by less than 10°C, which does not lower the reliability of the combustion chambers of modern gas turbine engines. Studies by General Electric have shown that with an increase in the content of aromatic hydrocarbons from 15 to 25 percent by volume the walls of fire tubes cannot be heavily overheated, but with an increase in this content to 35 to 38 percent the temperature conditions for the operation of chambers are complicated considerably and harmful emissions in exhaust gases are increased drastically. It is concluded that it is necessary to improve the design of combustion chamber fire tubes for the purpose of using these fuels in aircraft engines. Figures 3; references 8: 4 Russian, 4 Western.
[40-8831]

USSR UDC 62-634.2:665.658.2:66.094.382

CHEMICAL STABILITY OF HYDROREFINED FUELS AND THEIR STABILIZATION BY ANTI-OXIDANTS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 38-41

SABLINA, Z. A., TISHINA, YE. A., YEGOROVA, K. A. and YERMAKOVA, T. I.

[Abstract] In the process of hydrorefining modern fuels, along with undesirable components are removed also naturel inhibitors of oxidation. The results are given of a study of the oxidizability of samples of new types of jet fuel produced by employing hydrorefining and hydrogenation, and of the effectiveness of commercial antioxidants in chemical stabilization of these fuels. The method of investigation employed was the repeated oxidation at 120°C of the same portion of fuel. One hundred and ten milliliters of fuel were poured into the container of an instrument for determining the corrosion activity of fuel, the fuel was heated to 120°C, and the container was connected by means of a ground-glass joint to a reflux condenser. Four containers with the same fuel were placed in the instrument at the same time. The fuel was held at this temperature for six hours in four steps, between which the instrument was shut off. At the end of each step an estimate was made of the degree of oxidation of the fuel and a determination was made of its peroxide number, optical density, acidity and gum existent content. The peroxide number was determined by potentiometric titration with a 0.1 N solution of $Na_2S_2O_3$ of a weighed quantity of the sample in a solvent. Optical density was determined with a model FEK-56 photoelectric calorimeter-nephelometer with a standard iso-octane as the reference. Acidity was determined by the modernized ASTM D 974 method, in which the sample was dissolved in a mixture of toluene and isopropyl alcohol containing a slight quantity of water and the single-phase solution produced was titrated at room temperature with a 0.1 N solution of KOH in the presence of an indicator until the yellow color became pinkish red. The gum existent content was determined according to GOST [All-Union State Standard] 1567-56. IR spectroscopy was also employed, making it possible to observe the kinetics of the accumulation of the end products of oxidation from the absorption bands for C=O, C-O and O-H bonds. Subjected to study were fuels T-6, T-8 and RT. Under the conditions of the experiment, both intensely hydrogenated fuels (type T-6) and hydrorefined fuels (types T-8 and RT) oxidized considerably. The results demonstrate that the tendency toward oxidation which has been observed in jet fuels is characteristic of hydrorefined and hydrogenated fuels of practically all modern types. Under mild conditions these fuels oxidize with the formation of soluble products; therefore it is necessary to stabilize them with antioxidants. Studies were made of major commercial fuel antioxidants belonging to different classes of chemical compounds. A study was made of the relative effectiveness of antioxidants in the stabilization of fuels T-6 and T-8

by the same method used for determining the oxidizability of these fuels without additives. The results demonstrate that all the domestic and foreign antioxidants studied effectively stabilize these fuels. The intensely hydrogenated fuel T-6 is more difficult to stabilize than hydrorefined fuel T-8. The best results were obtained with the antioxidants 2,6-di-tert-butyl phenol (Topanol'O), 2,4-dimethyl-6-tert-butyl phenol (Topanol'A) and 1,1,3-548s(2-methyl-5-tert-butyl-r-oxyphenol) butane (Topanol'CA). Tests also demonstrated that the minimum effective concentration of antioxidants can be reduced, in particular for the least stable type T-6 fuel, to 0.001 to 0.002 percent by weight. It is concluded that it is feasible to stabilize with antioxidants all modern hydrorefined and intensely hydrogenated fuels. Figures 4; references 9 Russian. [40-8831]

USSR UDC 547.314.42.002-4

SEPARATION AND UTILIZATION OF ACETYLENE AS A BY-PRODUCT OF OLEFIN PRODUCTION

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 41-43

BEREZHNAYA, K. P., BYSTROVA, T. A., ZELENTSOVA, N. I., AVREKH, G. L. and SHAMRAY, O. B.

[Abstract] From 0.1 to 0.8 percent by weight of acetylene is contained in the pyrolysis gas, depending on pyrolysis conditions and the composition of the hydrocarbon raw material. At the gas separation stage practically all the acetylene goes into the ethane-ethylene fraction, where its content is 0.4 to 2.2 percent by weight. The refining method employed in industry is based on the selective hydrogenation of acetylene, which results in the destruction of acetylene as a commercial product. The acetylene lost is negligible in small units, but becomes considerable in large-capacity olefin plants. In a plant with a capacity of 300,000 tons per year, working on gasoline, as many as 20 kg of acetylene per one ton of ethylene are formed, or 6000 tons per year. It is recommended that for existing and future olefin production processes, commercial acetylene be extracted from the ethane-ethylene fraction by using dimethyl formamide as a solvent. The acetylene is extracted in two stages, at the first of which the acetylene is absorbed from the ethane-ethylene fraction at a pressure of 2.8 MPa at -10°C with subsequent desorption at a pressure of 120 kPa. The gas stream enriched with acetylene leaves the desorber and enters the second stage of the process, in which acetylene is extracted in an absorber at a pressure of 120 kPa and at -7°C. The saturated solvent is sent to the desorber, in which under the same pressure a commercial acetylene-ethylene fraction containing up to five percent by volume of ethylene is eliminated. For the purpose of safety in

extracting acetylene, it is recommended that only the first stage of the system be installed in the area of the olefin complex, and the second, in which concentrated acetylene is produced, beyond the limits of this area. It is recommended that the acetylene by-product be used in the gas flame treatment of metals. Ethylene plants are located in all industrially developed regions of the country experiencing an acute need for acetylene. The extraction of acetylene as a by-product would make it possible to reduce the consumption of scarce calcium carbide. Acetylene derived from olefin production products does not require additional cleaning. The imputed costs of the production of commercial acetylene with olefin plants are almost three- to fourfold lower than for producing carbide acetylene with stationary gas producers. The production cost of acetylene as a by-product of olefin production is 1.5-fold lower than with the most advanced mothod, the pyrolysis of natural gas. It costs about the same to produce acetylene as a by-product of olefin production as it does for the process of hydrogenation of acetylene. References 8: 5 Russian, 3 Western.
[40-8831]

USSR UDC 547.495.2:513.7:665.637.73

DISPERSED STRUCTURE OF THE CARBAMIDE COMPLEX IN THE PRODUCTION OF LIQUID PARAFFINS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 43-45

KHROMYKH, V. F., SPITSYN, V. I., TARAKANOV, V. S., KRISTAL'NAYA, M. S., KARAMYSHEV, M. S., SAMOKHVALOV, A. I., BROYTMAN, A. Z., and SHESHENINA, Z. YE., USSR Academy of Sciences Institute of Physical Chemistry and Novo-Yaroslavskiy NPK [Petroleum Products Complex]

[Abstract] A study of the structural-mechanical, filtration, adhesion and other physicochemical properties of the carbamide complex is important because these properties to a considerable extent determine the technology and equipment used in the deparaffination of fuels. The results are given of measurements of the dispersed (granulometric) structure of the carbamide complex by the sifting, filtration, sedimentation and electron microscopy methods. Commercial samples of suspension were studied from the Novo-Yaroslavskiy NPZ [Petroleum Products Plant] complex, selected from the Ye-1, T-6/1, Ye-2, Ye-3/1, Ye-3/2 and Ye-3/3 units of the G-64 plant. Also studied was the original carbamide. Sifting was performed with a 028M sieve analyzer. Fifty grams of powder dried at 50°C were poured into the upper sieve and sifting was considered complete when in 2 min the weight of the powder in the sieve changed by not more than 0.5 percent. The results of the sieve analysis are expressed as a percentage of the content of each fraction. Filtration analysis was performed

with an FPAN-27 unit designed by the USSR Academy of Sciences Institute of Physical Chemistry. The suspension was put into a 1 cm^2 filtering cell, left for 15 min, and the residue was compacted by a moving piston with a porous diaphragm. A mild solvent, BR-1 benzine and acetone, was filtered through the compacted residue at a steady pressure. The equivalent diameter of particles was calculated by the familiar equations. Sedimentation analysis was performed by the method of continuous weighing of the sediment in the pan of a VT-500 torsion blaance. The suspension was placed in a measuring beaker and diluted with a mild solvent so that the concentration of the solid phase in the suspension would equal 0.1 to 0.25 percent. The readings of the torsion balance were recorded for 2 h. Sedimentation curves were analyzed analytically by plotting a distribution curve. An IEM-120 Japanese scanning electron microscope was used to take electron microscope photographs of particles of the complex. Magnifications of 1000, 3000 and 10,000 were employed. Differential and integral distribution curves are given for particles in terms of size in the initial carbamide, according to the data of sieve analysis. Close results were obtained for all the methods of analysis employed. The dispersed structure of the initial carbamide obeys a log-normal distribution law for particlss in terms of size. It was assumed that the degree of dispersion of the product produced as the result of crushing does not depend on the absolute dimensions of particles of the original material. In the C-64 plant mechanical crushing of the carbamide does not take place over a long period; the dimensions of particles of the initial carbamide are 100 to 400 microns (91.2 percent), the mean size of particles is 208 microns and the distribution median is 214 microns. It is necessary that dispersion analysis be performed under conditions excluding the influence of coagulation. In analyzing the ratio of the length to the diameter of particles, the electron microscope method gives the most accurate results. The data demonstrate that the sediment of the carbamide complex comes under the heading of a system with relatively high dispersion and small particles. A system of this type has high adhesion and adsorption properties. The dimensions of particles of this complex have a heavy influence both on the completeness of the separation of phases in a centrifugal field or in filtration and on the purity of paraffins separated from the complex. The fineness of the crystals of the complex and the surface phenomena associated with this account for difficulties encountered in the C-64 plant at the Novo-Yaroslavskiy NPZ. These include the fact that when the complex is flushed the necessary degree of separation of paraffins and aromatic hydrocarbons is not achieved, the sediment has a great tendency to stick, thus hindering separation of the suspension in centrifuges and hydraulic cyclones, and the transprotability of the suspension is inadequate. Figures 3; references 6 Russian.
[40-8831]

USSR UDC 678-13:678.012.4

MOLECULAR WEIGHT AND COMPOSITION DISTRIBUTION OF COPOLYMERS OF ISOBUTYLENE WITH DICYCLOPENTADIENE AND ALPHA-METHYL STYRENE

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 10, 1979 pp 47-49

AKHMEDOV, A. [illegible], LEVSHINA, A. M. and SADYKHOV, Z. A., Azerbaydzhan SSR Academy of Sciences Institute of Chemical Physics

[Abstract] The results are given of a study of the molecular weight and composition distribution of copolymers used as viscous additives for the purpose of thickening oil. A key requirement for viscous additives is homogeneity in their molecular weight and composition with a specific mean molecular weight. The additives currently used, polyisobutylene, in particular, are subject to destruction under the influence of thermal and mechanical effects, resulting in a reduction in the viscosity of the oils thickened by them under conditions of use. The additives studied are modified polyisobutylenes produced by the copolymerization of isobutylene with dicyclopentadiene and alpha-methyl styrene. The addition of dicyclopentadiene and alpha-methyl styrene links to the polyisobutylene chain results in, as it were, polyalkyl derivatives of carbocyclic and aromatic hydrocarbons with better resistance to thermal oxidation and mechanical effects than hydrocarbons with an open chain. The method of fractionation by fractional precipitation was employed to investigate the molecular weight distribution of these copolymers. Hexane was used as a solvent and isopropyl alcohol as the precipitator. The concentration of copolymers in the solution equaled one percent. Integral and differential curves are presented for the distribution of copolymers by molecular weight. The data obtained were used to calculate the coefficient of the molecular weight inhomogeneity, U, equaling the ratio of the mean-weight molecular weight to the number-average. Copolymers of isobutylene with alpha-methyl styrene are characterized by a relatively broader molecular weight distribution, U = 1.77, than copolymers of isobutylene with dicyclopentadiene, U = 1.59. Both copolymers have a narrower molecular weight distribution than does polyisobutylene, for which U = 2.91. A study was also made of the molecular weight distribution of copolymers after destruction, for the purpose of explaining the nature of the change in the molecular weight of copolymers during thermal and mechanical effects in an oil solution. Under these conditions, first subjected to destruction are macromolecules of relatively high molecular weight, resulting in a reduction in molecular weight inhomogeneity, for fractions with closer molecular weights accumulate in the copolymer, For example, the main share of fractions of the initial copolymer of isobutylene with dicyclopentadiene belongs to molecules with a molecular weight of 5000 to 15,000, and after mechanical destruction to molecules with a molecualr weight of 2000 to 9000, and after thermal destruction of 3000 to 12,000. Since the composition distribution of copolymers also

determines their physicomechanical properties, an investigation was made of this distribution by the method of adsorption chromatography employing grade ASK silica gel. Fractionation was performed in a three-stage column filled with silica gel, with the weight ratio of copolymer and silica gel equaling 1:20. Elution was performed with solvents with increasing polarity. After removal of the solvent, a determination was made in fractions of copolymers of the number of dicyclopentadiene links, by the bromine number method, and the alpha-methyl styrene links by the UV spectroscopy method. Integral and differential distribution curves are presented. The results show that copolymers of isobutylene with dicyclopentadiene and alpha-methyl styrene are close in composition. Therefore, the composition inhomogeneity of macro-molecules cannot cause a difference in the behavior of these copolymers during destruction. The composition of the copolymers studied does not change in thermal and mechanical destruction. When dicyclopentadiene and alpha-methyl styrene links are added to the polyisobutylene chain, products are formed which are more homogeneous in terms of molecular weight than is polyisobutylene. This explains the advantages of these copolymers over polyisobutylene.
Figures 3; references 7: 6 Russian, 1 Western.
[40-8831]

USSR UDC 66.012.46

STATE OF THE ART OF THE PROCESS OF STEAM CONVERSION OF HYDROCARBONS AND POSSIBILITIES FOR INTENSIFYING IT (SURVEY)

Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 5, 1979 pp 29-34 manuscript received 6 Apr 78

IL'YENKO, B. K., Ukrainian SSR Academy of Sciences Institute of Gas Utilization

[Abstract] A survey is given of worldwide progress in the area of mastery and improvement of the process of catalytic steam conversion of hydrocarbons, which is the chief method of producing hydrogen-containing gases for the production of ammonia, methanol and industrial hydrogen. The development of the process is due to the 1.5- to 2.5-fold climb in the production of hydrogen on a worldwide basis projected by 1980 as compared with 1970. The production of ammonia and methanol in the Soviet Union will have climbed two- to threefold during the same period. A history of the development of the process and equipment used is given, starting with the beginning of the 50's, when the process was accomplished for the first time under pressure. The increase in pressure in conversion furnaces became possible because of the development of new refractory materials and the mastery of the technology for fabricating tubes by the centrifugal casting method. The basic designs for tubular furnaces became

established by the beginning of the 60's. Widespread in the industry are furnaces of the direct flow type equipped with jet burners located in the crown. Heat is transmitted to the reaction tubes chiefly by radiation from smoke gases. In these furnaces the smoke gases and steam-and-gas mixture in the tubes move in the same direction and the temperature of the smoke gases is lowered along the way. This makes it difficult to maintain optimal temperature conditions along the length of the tubes and it becomes possible for the tubes to overheat in the inlet section. The chief source of raw material for the process remains natural gas. Conversion catalyzers are being improved by reducing their hydraulic drag and improving their mechanical characteristics. A nickel catalyzer for the conversion of natural gas developed at the Ukrainian SSR Academy of Sciences Institute of Gas Utilization has high longterm strength and resistance to heat loads. A major trend in development of the process has been an increase in the capacity of plants. The capacity of conversion furnaces with burners arranged horizontally is 50,000 to 60,000 tons of hydrogen per year, which is believed to be the limit for this type of furnace. Furnaces of the direct flow type have reached a capacity of 100,000 to 120,000 tons per year of hydrogen in the production of ammonia. The largest conversion furnace is owned by the Japanese, with a capacity of 170 tons of ammonia per 24-h period. Plans are being made to construct even larger furnaces. Conversion furnaces nevertheless have fundamental shortcomings which are difficult to overcome. These concern chiefly the exceptionally severe operating conditions for reaction tubes. The wall temperature of tubes reaches 1000 to 1050°C with normal operation. This is close to the maximum for the metal's yield point at pressures of 20 to 40 atm. Grade HK-40 steel is usually used for making reaction tubes; the Soviet analog of this is grade 45Kh25N20S2 steel. One of the reasons for the shutdown of tubular furnaces is the bursting of reaction tubes, which accounts for 53 percent of all shutdowns. One study shows that shutdowns occurred for this reason in 78 percent of all units after six years and more of operation. The specifications for the operating conditions of tubes account for the low intensity of the conversion process in modern furnaces. This intensity has reached its limit for materials which have been mastered. HK-40 steel is highly sensitive to overheating. A major trend in recent years in the improvement of tubular furnaces has been the development of new grades of flame-resistant steel for making tubes and other stressed elements of furnaces. It is believed that HK-40 steel will remain the basic material for reaction tubes for some time, inasmuch as the new steels are much more expensive; Supertherm costs twice as much as HK-40. An analysis is made of the state of the art of the process of the steam conversion of hydrocarbons in tubular furnaces and it is demonstrated that the possibilities for intensifying this process have practically reached their limit. The most promising trend in the development of this process if the search for methods of intensifying the delivery of heat to the catalyst bed. One way to solve this problem is to employ a fluidized catalyst bed. The results are discussed of studies made along this line. The results are given of studies employing the principle of supplying heat to a fluidized catalyst

bed through the wall of the equipment or the tubular surface. In tests of a reactor designed by GIAP [State Scientific Research and Design Institute of the Nitrogen Industry and Products of Organic Synthesis] with an inside diameter of 150 m, the coefficient of heat transfer from smoke gases equaled 1000 kcal/$m^2 \cdot h \cdot deg$. The employment of tubular reactors with a fluidized bed in large conversion plants in all probability involves considerable engineering difficulties. In a process developed by the USSR Academy of Sciences Institute of Petrochemical Synthesis and the Ukrainian SSR Academy of Sciences Institute of Gas Utilization, the heat required for the conversion reaction is supplied to a reactor with a fluidized catalyst bed by means of a solid circulating heat transfer agent. This agent imparts its heat to the catalyst and as a result of the difference in the specific gravity and dimensions of particles it is separated through the fluidized bed. The heat transfer agent is fed pneumatically from the reactor into a heater, where it is heated to 1000 to 1100°C with the combustion of natural gas in the fluidized bed. The heat transfer agent thus circulates continuously through a loop consisting of the heater, reactor, pneumatic transport line, and the heater again. Results of studies of this unit have shown that the intensity of the process is 10- to 20-fold higher than in tubular furnaces. The high intensity of the process makes it possible to develop equipment of relatively small size. Low-alloy steel can be used to make this equipment. It is also possible to carry out the process by using as a heat transfer agent a material which absorbs CO_2 directly in the reactor, thus resulting in deeper conversion of hydrocarbons with a simultaneous lowering of the temperature in the reactor by 150 to 200°C. The adoption of this process requires a great deal of engineering work since there has been no practical experience in carrying out high-temperature processes in a fluidized bed under pressure with a separating heat transfer agent. Figures 1; references 50: 23 Russian, 27 Western.
[41-11,176]

USSR UDC 66.094.197.3:001.5

METHOD OF DISCHARGING THE CATALYST FROM A TUBULAR FURNACE FOR THE PRIMARY REFORMING OF METHANE

Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 5, 1979 pp 36-37 manuscript received 17 May 79

DENBNOVETSKAYA, YE. N. and KRAVTSOV, A. I., Ukrainian SSR Academy of Sciences Institute of Gas Utilization

[Abstract] Difficulties in discharging the exhausted catalyst from the tubes often occur when using tubular furnaces for the primary reforming of natural gas in the production of ammonia. Catalyst granules become wedged in a tube, become clumped together, or the catalyst breaks down.

The results are given of studies of a laboratury unit for discharging the catalyst from the tubes by means of a vibrating metal rod. The vertical rod had an inside diameter of 78 mm and was 600 mm high. The catalyst was loaded into the tube and compacted by knocking the side walls of the tube until maximum settling was achieved. Various catalysts were used, including KSN-20, KSN-15, GIAP-16 and a Czech oxal-nickel catalyst. The respective heights of the catalyst bed were 286 mm, 196 mm, 190 mm and 600 mm. The vibrator had a vibration rate of 50 Hz, a vibration width of 1 mm and a power of 30 W. Each catalyst was loaded 10 times into the tube and the tube's wall was vibrated for two minutes. The tube was then lifted and a determination was made of the extent of sticking of the catalyst. Then the vibrator was applied to the wall of the tube and a determination was made of the time required to totally empty the catalyst. The vibrating rod was inserted into the tube as far as was required to empty it. Attempts were also made to empty the tube by striking its wall. Full-scale tests were also made in an industrial plant, in which the KSN-2 catalyst was loaded into reaction tubes which were subjected to extreme overheating. The usual poking method took several men 30 min to empty the tube. When employing the new method a single man emptied the tube in 2 min. The new method, in addition to its speed, has the important advantage that there is no danger of harming the welded joints between tubes and the collector. This damage is possible with the other methods of hitting the tubes with a mallet and vibrating them.
[41-11,176]

NEW WATER TREATMENT METHODS

Moscow IZVESTIYA in Russian 1 Nov 79 p 1

[Article by S. Tsikors: "The Second Life of Water"]

[Text] The scientists of the Ukrainian Academy of Sciences proposed a new approach to the purification of tap water as well as the restoration and recycling of technical and industrial effluents.

This novel approach to the problem was made possible by an original theory developed by the academician of the Ukrainian Academy of Sciences, L. Kul'skyy. Water impurities were classified by their so-called phase dispersion states, and separated into several groups. Standard water purification blocks have been developed for each group of impurities. Regardless of how complex an industrial effluent was, water could be recycled, and its clarity restored, once it has been passed through the standard purification blocks assembled in a certain order, tailored to the composition of the impurities.

The apparatus and purification methods suitable for block design of water purification plants was developed at the Institute of Colloidal Chemistry and Water Chemistry, UkrSSR Academy of Sciences, where L. Kul'skyy heads a section. Both the apparatus and the purification methods were tested under production conditions at water supply stations and in industrial plants. They proved to be excellent. Standard purification blocks made it unnecessary to design and build individually customized purification installations.
[66-7813]

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SEARCH FOR WATER SOURCES AT THE CENTRAL SECTION OF THE BAYKAL AMUR TRUNK LINE

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 2, 1979, pp 8-9

[Article by engineers P.I. Durachenko and A.A. Korolev (Mosgiprotrans)]

[Text] Search and prospecting for water supply for the BAM [Baykal Amur Trunk Line]-Tunda, Tunda-Berkakit and Tunda-Urgal lines of the central section of the BAM are difficult since these lines are located in an area of severe natural conditions in a region of occurrence of perennially frozen rocks. The cost of construction of water supply systems and the extent of engineering communications and operational expenses determine the successes and quality of the searches conducted. Surface streams, rivers, brooks carrying high quality water may be used in summer only since, in winter, many of them are frozen completely and discharge ceases. It is impossible to use surface water sources for year-round water supply except for the water of major rivers such as the Zeya and the Selemdzha. The only possible source of year-round water supply is underground waters. However, the conditions of their formation and their distribution in this region is inadequately studied.

A great part of the central section of the BAM passes through a series of hydrogeological massifs which are characterized by extensive development of intrusive crystalline: metamorphic and complexly dislocated rock, terrigeneous rocks, by medium-altitude and low hills and also by plateaus. The width of the frozen zone in them is mainly less than the width of the zone of the fissured state which contains underground waters and constitutes, as a rule, 50-100 m. On the slopes of water divides, on slopes of southern exposure along tectonic breaks are noted taliks through which occurs infiltration of atmospheric precipitations into the depth of the rocks during summer rains which constitutes from 70 to 90 percent of the annual norm of precipitations. From these regions, the underground waters begin to move along cracks which run through the thickness of the rocks to a depth of no less than 100-200 m. Therefore here, for centralized water supply, we use underground waters of rocks in zones of tectonic fragmentation, which frequently are expressed in the relief and are noticeable by the definite

vegetation. The most watery sections of such zones are situated beside sources of subfrozen waters which form seasonal waters above the ice.

The Mosgiprotrans Institute is conducting search and prospecting operations for underground waters based on peculiarities of the landscape of the locality. During this operation, the following procedure is used in searches for items with water requirements of 1000-3000 m^3/day;

collection and systematization of geological and hydrogeological materials. If there are no available high quality aerial photographs of the locality, an aerial photographic survey of the locality is conducted in the most felicitous period when the snow cover is thawing and the water above the ice remains. This period, for the central section of BAM is from 20 April to 10 May. Aerial photographs are used to compile a plan for plotting contour lines, the hydrographic network, the contours of water above the ice, the topographical boundaries and the tectonic disturbances;

reconnaisance of hydrogeological observation for an area of 20-25 km^2 for the purpose of revealing water sources, waters above the ice and also for selection of sections for conducting geophysical prospecting. The complex of geophysical methods includes basically electroprospecting (vertical electroprobing, electroprofiling, circular electroprobing) magnetoprospecting and also well logging, resitivometry, thermometry and determination of the rate of movement of the underground waters;

geophysical profiles for the area of survey at stages of the searches are assembled at distances from 200 up to 500 m. For detailed surveying of small sections, the distance between profiles is 50-100 m. The distance between points of vertical electrical probing is changed from 250 to 25 m in dependence upon the phase of the mapping and, during magnetoprospecting, the interval of points of observation is 25 m while at anomalies, it is reduced to 10 meters. After this, we drill prospecting and test wells and conduct experimental pumping of water and calculation of exploitable supplies of underground waters;

after drilling the wells, we conducted well logging in order to determine the physical properties of the rocks, the presence and thickness of the frozen ground and to discern the intervals of water intake into the well. The complex of well logging studies reveals the electrical resistance of the rocks; their temperature, the diameter of the well throughout its depth, the spontaneous polarization and also the rate of movement of the underground waters.

Using this search method, Mosgiprotrans conducted search and prospecting operations of underground waters for railroad stations and stations and

double tracks (on a single track railway) which ensured the provision to them of high quality drinking water from reliable underground sources.

The discharge of operational wells in granatoids reaches 10-30 liters/sec at a depth of wells of 100-200 m. The distance of the sources from the water consumers does not exceed, as a rule, 1-2 km and up to 5 km for major objects. The cost of the water does not exceed 10-14 kopecks per cubic meter. Due to reduction of the length of pressure water pipelines, the number of operational wells, water heating boilers at intakes, the construction costs of water supply systems at many stations is reduced to ranges of from 0.6 to 1.1 million rubles. Operational expenses and electrical energy and heat supply expenditures also were reduced signifi-antly.

Conclusion

1. Thus, the quality of the searches conducted determine the cost of construction of water supply systems, the extent of engineering communications and operational expenditures.

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MONITORING SURFACE WATER SUPPLY SOURCES FROM SPACE

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 2, 1979, p 9

/Article by Engineer A.I. Melnn (Leningrad Scientific Research Institute Pradostroitel'stva/

/Text/ A source of water supply for settlements in the region of the BAM /Bakayl-Amur Trunk Line/ and for the overwhelming majority of settlements in other territories will be either open reservoirs or underground waters. A major problem, during exploitation of them, is the sanitation and hygiene control of the condition of natural areas containing drinking water supply sources, which may be frozen for many hundreds of square kilometers. Agencies of the sanitation and epidemiological service exercise such control in the country. The use of traditional methods of control of the state of drinking water sources in the region of BAM is impossible since this region is characterized by extremely low assimilability of the territory and by complex natural conditions.

One means of solving this problem is the use of photographs of the Earth from space. Such photographs show clearly hydrological objects, vegetation, roads, etc.. These photographs reveal areas of pollution of water basins, indicate the sources of pollution and trace the dynamics of their distributions.

Optical observations from space still cannot be used as a method of regular sanitation surveillance but they can be used for a single inspection or for confirming data of aerial observations.

If pollutions are detected, the danger of them for water supply sources is evaluated. Standard measures for the localization and decontamination of pollutions are being developed. An intake may be closed temporarily or necessary supplimentary purification of water intended for domestic use may be conducted.

Presently, the Leningrad Scientific Research Institute of Town Building is developing methodical instructions for use of results of analysis of space photographs for selection of water supply sources.

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SYSTEMS OF WATER SUPPLY, WATER, WATER DIVERSION AND SEWAGE TREATMENT OF SETTLEMENTS OF NORIL'SK RAYON

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 2, 1979, pp 28-29

[Article by Engineer S.S. Okhrimenko (Noril'shproyekt)]

[Text] Noril'sk Rayon is a region of severe climatic conditions and there are large permafrost areas which, upon thawing, become unsuitable for use as a natural foundation for water diversion buildings and installations. Under these specific conditions, during design of water supply and water diversion systems, it is necessary to provide for preservation of the permafrost state on the soils in the foundation of buildings and installations which ensure stability of the soil foundation or to use frozen in piles with a high carrying capacity and to organize drained subfloors in the buildings.

Several water intake installations from surface and underground sources have been constructed to provide Noril'sk Rayon with drinking and industrial water supplies.

One of the basic water supply systems is the intake from the Noril'sk River consisting of a delivery canal, a shoreline pumping station for the first lift, 1200 mm diameter delivery pipelines, receiving compartments and two pumping stations of the 2d lift of industrial and drinking water and also pumping stations of the 3d, 4th and 5th lifts, which provide the water supply to the users.

The drinking water supply pumping station unit is situated near the town and consists of a receiving tank, a group of booster pumps, purification installations (contact clarifiers), drinking water reservoirs and groups of pumps for flushing out the contact clarifiers and feeding the clarified water from the reservoirs in the city pipeline, from pipelines to 2d lift stations.

Drinking water supply systems for isolated areas (individual settlements) are supplied by water from underground sources. These systems consist of wells with pumping stations above them, delivery pipelines and units of 2d lift pumping stations which include drinking water reservoirs, pumping plants and bactericidal and fluoridation devices.

Water diversion systems of populated areas of Noril'sk Rayon consist of gravity and pressure collectors, pumping stations and purification installations for biological treatment.

The lining of water supply and water diversion pipelines in the city limits usually consist of underground 2-level, ventilated, straight-through, communication channels from reinforced concrete elements, together with heat supply networks, communications cables and electrical cables. Water supply and heat supply pipelines are placed in the upper level and water diversion and cables are situated in the lower level. Connection of communications of residences to street engineering networks is performed in ventilated transfer single layer conduits made from reinforced sectional concrete elements. The conduits are designed and constructed so as to preserve the permafrost state of the soils at the base of the conduits by means of heat insulation of the pipelines, ventilation of the conduits and "cushioning" devices (under the conduit) of lean concrete or sand under which is packed a 200 mm thick clay puddle "trough" with elevation of the sides to 200 mm above the bottom of the conduit. If necessary, the ice-saturated soil is replaced by loamy, thawed soil to a depth of up to 1 meter below the concrete trough.

Main water pipelines are heat insulated and are installed along the surface of the ground on pile supports, fastened at designed points on anchor supports between which are placed self-packing, packing glands or P-shape balancers. Equipment which does not freeze is mounted on water pipes. Surface packing of pipelines is most effective since it prevents a thermal effect of the pipeline on the soil in the foundation and does not disturb the plant cover of the tundra.

Pumping stations are constructed according to typical designs on pile foundations or with installation of cooling and ventilating conduits.

Biologically cleaning purification installations under construction consist of: PD-600 type lattice crushers, sand traps with circular movement of the liquid, horizontal settling tanks, 20 m diameter aeroaccelerators and a contact tank.

Water removal from the raw sediment is produced on NOGSh-325-5N centrifuges since the use of open silt areas is not permissible because of the climatic

conditions and the use of closed compartments is inadvisable in view of the large capital investments involved and the low effectiveness of drying. Decontamination of the settlings is performed in a dehelminthization tank.

The Institute of Norol'skproyekt is developing a design of "Sever BIO" type installations for biological purification with a productivity from 100 up to 700 m^3/day.

Purification installations consist of a receiving tank, manual grids, an assembly of air tanks with settling tanks and a contact tank. The air tanks operate according to a prolonged aeration scheme. The air is fed along perforated tubes from the air blower. The silt is pumped by airlift pumps. The cleaned water is decontaminated by hydrochloride.

Conclusions

1. A peculiarity of purification and other installations in Noril'sk Rayon is the installation of them in closed areas, removal of silt areas, organization of scavenging subfields and use of pile foundations which preserve the soils in the foundation of the installation in a frozen state. These measures ensure reliable stability of buildings and installations of water supply and water diversion systeme.

2. In spite of the positive solution of a whole series of technical and structural tasks, the problem of installation of water supply and water diversion systems in northern regions requires further improvement.

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